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OFFICIAL PUBLICATION OF THE PROCEEDINGS, AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

American Dyestuff Reporter was founded in 1917 and the Textile Colorist and Converter (formerly Textile Colorist) was incorporated with it in January, 1949. Published every other Monday, by the **HOWES PUBLISHING COMPANY, INC.**, 44 East 23rd Street, New York 10, N. Y. **C. R. Howes**, President; **Ernest J. Finan**, Executive Vice-President; **Norman A. Johnson**, Vice-President & Treasurer; **Myron D. Reeser**, Vice-President; **C. Essenbreis**, Secretary.

Telephone SPring 7-9364

AMERICAN
DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

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Proceedings of the
American Association of Textile Chemists and Colorists

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August 26, 1957

NOMINATION NOTICE

THE Councilors representing Sections, in their capacity as Nominating Committee, have nominated George O Linberg for president in the year 1958. The nomination of any other Senior member, signed by fifty or more Senior members, may be filed with the executive secretary not later than October 1st, and will be given equal standing on the ballot.

The members of the Northern New England, Rhode Island and Western New England Sections will elect a vice president for the New England Region. The Councilors from this Region have nominated Ernest R Kaswell.

The members of the Delaware Valley, Hudson-Mohawk, New York, and Niagara Frontier Sections will elect a vice president for the Central Atlantic Region. The Councilors from this Region have nominated Weldon G Helmus.

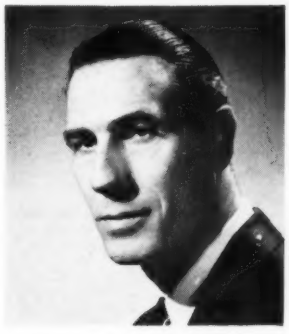
The members of the Piedmont, Southeastern, South Central and Washington Sections will elect a vice president for the Southern Region. The Councilors from this Region have nominated Walter M Scott and H Gillespie Smith.

The members of the Mid-West, Pacific Northwest and Pacific Southwest Sections will elect a vice president for the Western Region. The Councilors from this Region have nominated Elliott Morrill.

A nomination for vice president from any Region, signed by twenty-five or more members of that Region, may be filed with the executive secretary not later than October 1st, and on the ballot will receive equal standing with other nominations for that office.

GEORGE O LINBERG

ERNEST R KASWELL



WELDON G HELMUS

WALTER M SCOTT

H GILLESPIE SMITH

ELLIOTT MORRILL

COLOUR INDEX—CROSS INDICES

FOREWORD

The new *Colour Index* undoubtedly will become the standard reference publication on dyes, not only in the United States, but throughout the world. Part I provides a permanent generic name for each commercial dye type. Part II assigns a permanent *CI* number for each dye whose chemical constitution has been disclosed. In Part I, dyes are classified according to application class, while in Part II they are classified in accordance with chemical structure.

The sellers and commercial users of dyes are concerned primarily with the application class, while research chemists and manufacturers are also interested in chemical classification. Both groups are intensely interested in early use of the new *Colour Index;* but in order to have continuity of information and to operate effectively during this transition period, it is necessary for users to have available a cross index of names and numbers from the old edition to the new, and from the new to the old.

While cross indices are to be published in Part III of the new *Colour Index,* publication of this volume is not expected for several months. Therefore, in order that AATCC members, Government agencies collecting and publishing statistics on the dye industry, dye manufacturers, users, and others may make immediate use of the new *Colour Index,* the AATCC has prepared the following cross indices as a service to all active in the field of dyes.

I. Old Colour Index Numbers to New Colour Index Names and Numbers

Old CI No.	*New CI Name*	*New CI No.*
5	Pigment Green 12	10020
	Acid Green 1	
10	Food Yellow 1	10316
	Acid Yellow 1	
11	Acid Orange 3	10385
15	Solvent Yellow 1	11000
16	Acid Yellow 9	13015
17	Solvent Yellow 3	11160
	Azoic Diazo Comp 4	37210
19	Solvent Yellow 2	11020
20	Solvent Orange 3	11270B
	Basic Orange 2	11270
21	Basic Orange 1	11320
	Solvent Orange 4	11320B
22	Food Yellow 10	11380
24	Solvent Yellow 14	12055
26	Acid Orange 12	15970
27	Acid Orange 10	16230
29	Acid Red 29	16570
30	Acid Red 33	17200
31	Acid Red 1	18050
32	Acid Red 106	18110
	Acid Red 76	18115
35	Pigment Red 64	15800
	Pigment Brown 5	15800
36	Mordant Yellow 1	14025
38	Azoic Diazo Comp 7	37030
40	Mordant Orange 1	14030
44	Azoic Diazo Comp 37	37035
	Pigment Red 1	12070
46	Acid Red 74	13355
52	Mordant Yellow 14	14055
53	Acid Violet 3	16580
54	Acid Red 7	14895
56	Acid Violet 6	16600
57	Acid Violet 7	18055
61	Food Yellow 11	11390
68	Azoic Diazo Comp 12	37105
	Pigment Red 22	12315
69	Azoic Diazo Comp 8	37110
	Pigment Red 3	12120
73	Solvent Orange 7	12140
79	Acid Red 26	16150
80	Food Red 6	16155
82	Pigment Red 40	12170
84	Pigment Red 54	14830
88	Acid Red 17	16180
90	Acid Violet 13	16640
98	Mordant Brown 33	13250
99	Mordant Green 17	17225
101	Mordant Brown 4	11335
105	Mordant Brown 70	†13265
110	Mordant Yellow 36	14135
113	Solvent Red 1	12150
114	Acid Red 4	14710
117	Azoic Diazo Comp 5	37125
118	Azoic Diazo Comp 13	37130
122	Mordant Yellow 38	14080
126	Direct Red 47	14985
128	Direct Red 20	15075
130	Direct Red 51	14990
138	Acid Yellow 36	13065
142	Acid Orange 52	13025
145	Acid Orange 1	13090/1
	Acid Yellow 65	14170
146	Acid Yellow 63	13095
148	Acid Orange 6	14270
150	Acid Orange 20	14600
151	Acid Orange 7	15510
161	Acid Orange 8	15575
163	Pigment Red 57	15850
165	Pigment Red 53	15585
166	Pigment Red 52	15860
167	Mordant Brown 13	13225
168	Mordant Red 5	14290
	Mordant Red 20	—
169	Mordant Violet 5	15670
170	Mordant Black 9	16500
175	Acid Brown 6	14625
176	Acid Red 88	15620

† Similar to but not identical

Old CI No.	New CI Name	New CI No.
179	Acid Red 14	14720
180	Acid Red 12	14835
183	Acid Red 25	16050
184	Acid Red 27	16185
	Food Red 9	
185	Acid Red 18	16255
189	Pigment Red 49	15630
190	Pigment Red 63	15880
195	Mordant Yellow 3	14095
	Mordant Yellow 29	—
197	Mordant Yellow 20	14110
201	Mordant Black 3	14640
202	Mordant Black 17	15705
	Mordant Blue 5	—
203	Mordant Black 11	14645
204	Mordant Black 1	15710
208	Acid Blue 92	13390
209	Acid Blue 89	13405
214	Pigment Red 50	15500
216	Pigment Red 60	16105
	Mordant Red 9	
219	Mordant Yellow 5	14130
224	—	—
225	Direct Red 45	14780
226	—	—
228	—	—
234	Acid Orange 24	20170
235	Acid Brown 14	20195
238	Mordant Brown 18	20150
246	Acid Black 1	20470
247	Acid Green 20	20495
248	Solvent Red 23	26100
249	Acid Red 116	26660
252	Acid Red 73	27290
253	Acid Red 150	27190
258	Solvent Red 24	26105
261	Acid Red 177	27015
262	Acid Red 115	27200
267	Direct Black 3	27710
271	Acid Black 35	26320
274	Mordant Orange 6	26520
	Mordant Orange 10	26560
275	Acid Red 151	26900
278	Direct Red 81	28160
280	Acid Red 66	26905
288	Acid Blue 116	26380
	Acid Blue 118	26410
289	Acid Blue 113	26360
	Acid Blue 120	26400
292	Mordant Green 15	26925
294	Acid Black 18	27790
299	Mordant Black 5	26695
302	Mordant Green 12	27520
304	Acid Black 26	27070
	Acid Black 26A	27075
	Acid Black 26B	26690
305	†Acid Black 26A	†27075
306	Acid Black 32	26990
307	Acid Black 24	26370
308	Acid Black 7	26300
317	Direct Blue 132	27725
319	Direct Blue 67	27925
324a	Direct Red 118	—
325	Direct Violet 51	†27905
326	Direct Red 4	29165
	Direct Red 24	29185
	Direct Red 26	29190
	Direct Orange 26	29150
	Direct Orange 29	29155
327	Direct Red 23	29160
331	Basic Brown 1	21000
332	Solvent Brown 12	21010B
	Basic Brown 4	21010
336	Mordant Black 10	21720
343	Mordant Yellow 16	25100
346	Direct Yellow 26	25300
353	Direct Red 75	25380
364	Direct Yellow 4	24890
365	Direct Yellow 12	24895
370	Direct Red 28	22120
375	Direct Red 10	22145
376	Direct Red 17	22150
377	(Not in Part I)	22190
382	Direct Red 37	22240
	Direct Red 39	23630
385	Direct Red 44	22500
387	Direct Violet 22	22480
393	Direct Violet 12	22550
394	Direct Violet 1	22570
395	Direct Black 29	22580
400	Direct Red 43	22205
401	Direct Blue 2	22590
403	Direct Black 56	34170
405	Direct Blue 64	22595
406	Direct Blue 6	22610
409	Direct Orange 18	20215/6, 20230
410	Direct Yellow 1	22250
411	Direct Yellow 20	22410
415	Direct Orange 8	22130
419	Direct Red 1	22310
420	Direct Brown 2	22311
422	Direct Brown 58	22340
423	Direct Brown 59	22345
430	Acid Red 85	22245
	Acid Red 99	23285
	Acid Red 134	24810
	Acid Red 167	—
431	Mordant Red 8	23095
436	Direct Red 46	23050
441	Mordant Yellow 26	22880
443	Acid Red 97	22890
446	Direct Orange 10	23370
448	Direct Red 2	23500
464	Direct Blue 27	23750
466	Direct Blue 25	23790
471	Direct Blue 3	23705
472	Direct Blue 21	23710
477	Direct Blue 14	23850
478	Direct Orange 6	23365/75
487	Acid Red 89	23910
495	Direct Red 7	24100
499	Disperse Black 6	37235
	Azoic Diazo Comp 48	
502	Direct Blue 8	24140
508	Direct Blue 10	24340
512	Direct Blue 22	24280
515	Direct Blue 151	24175
516	Direct Blue 4	24380
518	Direct Blue 1	24410
520	Direct Blue 15	24400
533	Direct Blue 75	34220
539	Direct Black 9	31560/5
552	Direct Black 83	31850
560	Direct Brown 57	31705
561	Direct Brown 31	35660
567	Direct Blue 63	31910
576	Direct Blue 30	31955
577	(Not in Part I)	35680
581	Direct Black 38	30235
582	Direct Black 4	30245
583	Direct Green 1	30280
589	Direct Green 12	30290
593	Direct Green 6	30295
594	Direct Green 8	30315
595	Direct Green 39	30220
596	Direct Brown 1	30045
	Direct Brown 1A	30110
598	Direct Brown 6	30140
601	Direct Brown 21	30155
606	Direct Brown 44	35005/10
619	Direct Black 19	35255
620	Direct Yellow 11	40000
621	Direct Orange 15	40002/3
622	Direct Yellow 6	40001/6
628	Direct Brown 29	40505
631	Direct Yellow 19	40030
633	(Not in Part I)	40070
636	Acid Yellow 11	18820
	Acid Yellow 34	18890
639	Acid Yellow 17	18965
640	Acid Yellow 23	19140
	Food Yellow 4	
642	Acid Yellow 40	18950
652	Mordant Red 7	18760
653	Direct Orange 1	22375
		22430
655	Basic Yellow 2	41000
	Solvent Yellow 34	41000B
657	Basic Green 4	42000
	Solvent Green 1	42000B
658	Basic Blue 1	42025
662	Pigment Green 1	42040
	Basic Green 1	
663	Basic Blue 5	42140
666	Acid Green 3	42085
	Food Green 1	
667	Acid Green 9	42100
670	Acid Green 5	42095
	Food Green 2	
671	Pigment Blue 24	42090
	Acid Blue 9	
	Food Blue 2	
672	Acid Blue 1	42045
673	Acid Blue 7	42080
676	Basic Red 9	42500
677	Basic Violet 14	42510
678	Basic Violet 2	42520
680	Basic Violet 1	42535

†Similar to but not identical

Old CI No.	New CI Name	New CI No.
	Pigment Violet 3	
	Solvent Violet 8	42535B
681	Basic Violet 3	42555
	Solvent Violet 9	42555B
682	Basic Violet 4	42600
	Pigment Blue 5	42600
683	Basic Violet 13	42536
689	Solvent Blue 3	42775
691	Acid Green 11	42038
692	Acid Violet 19	42685
695	Acid Blue 34	42561
696	Acid Blue 13	42571
697	Acid Violet 49	42640
	Food Violet 2	
698	Acid Violet 17	42650
699	Acid Blue 75	42576
704	Acid Blue 110	42750
705	Acid Blue 48	42770
706	Acid Blue 93	42780
707	Acid Blue 22	42755
710	Direct Blue 41	42700
712	Acid Blue 3	42051
714	Acid Blue 5	42052
717	Acid Violet 15	43525
720	Mordant Blue 1	43830
722	Mordant Blue 3	43820
728	Basic Blue 11	44040
	Solvent Blue 6	44040B
729	Basic Blue 26	44045
	Pigment Blue 2	
	Solvent Blue 4	44045B
735	Acid Green 16	44025
737	Acid Green 50	44090
748	Acid Red 52	45100
749	Basic Violet 10	45170
	Pigment Violet 1	
	Solvent Red 49	45170B
752	Basic Red 1	45160
	Pigment Red 81	
	Pigment Red 80	†45160
757	Acid Violet 30	45186
758	Acid Violet 9	45190
	Solvent Violet 10	
766	Acid Yellow 73	45350
768	Acid Red 87	45380
	Pigment Red 90	
	Solvent Red 43	45380A
771	Acid Red 91	45400
772	Acid Red 95	45425
773	Acid Red 51	45430
	Food Red 14	
778	Acid Red 92	45410
779	Acid Red 94	45440
781	Mordant Violet 25	45445
788	Basic Orange 14	46005
789	Basic Orange 10	46035
793	Basic Orange 15	46045
797	Basic Yellow 9	46040
800	Solvent Yellow 33	47000
801	Acid Yellow 3	47005
802	Acid Yellow 2	47010
812	Direct Yellow 59	49000
813	Direct Yellow 9	19540
814	Direct Yellow 28	19555
	Direct Yellow 29	19556
815	Basic Yellow 1	49005
816	Direct Yellow 7	49010
833	Acid Blue 59	50315
	Acid Blue 102	50320
841	Basic Red 2	50240
842	Basic Violet 5	50205
853	Acid Blue 18	50230
860	Solvent Blue 7	50400
861	Acid Blue 20	50405
864	Solvent Black 5	50415
	Solvent Black 7	50415B
865	Acid Black 2	50420
870	Oxidation Base 1	50440
871	Oxidation Base 2	76085
873	Basic Black 1	50431
875	Oxidation Base 10	76060
878	Mordant Blue 56	51120
883	Mordant Blue 10	51030
909	Basic Blue 6	51175
913	Basic Blue 12	51180
922	Basic Blue 9	52015
924	Basic Green 5	52020
931	Mordant Blue 51	52055
933	Sulfur Brown 1	53000
937	Sulfur Brown 2	53060
948	Sulfur Orange 1	53050
	Sulfur Brown 26	53090
949	Sulfur Brown 10	53055
950	Sulfur Yellow 1	53040

† Similar to but not identical

Old CI No.	New CI Name	New CI No.
951	Sulfur Yellow 2	53120
952	Sulfur Yellow 3	53125
955	Sulfur Yellow 4	53160
956	Sulfur Blue 1	53235
	Sulfur Blue 5	
	Sulfur Blue 11	
957	Sulfur Blue 9	53430
959	Sulfur Blue 7	53440
961	Sulfur Blue 13	53450
969	Vat Blue 43	53630
978	Sulfur Black 1	53185
	Sulfur Black 2	53195
	Sulfur Black 10	53190
983	Sulfur Black 2	53195
1002	Sulfur Green 11	53165
1006	Sulfur Green 3	53570
	Sulfur Green 2	53571
1012	Sulfur Red 6	53720
	Sulfur Red 1	53721
	Sulfur Brown 12	53721
1027	Mordant Red 11	58000
	Pigment Red 83	
1028	Pigment Violet 12	58050
1034	Mordant Red 3	58005
1035	Mordant Brown 42	58200
1039	Mordant Red 4	58240
1053	Acid Blue 43	63000
1054	Acid Blue 45	63010
1060	Mordant Blue 8	58805
1062	Mordant Blue 32	58605
1073	Solvent Violet 13	60725
	Acid Violet 43	60730
1075	Solvent Blue 11	61525
	Acid Blue 27	61530
1076	Acid Blue 47	62085
1078	Solvent Green 3	61565
	Acid Green 25	61570
1080	Solvent Violet 14	61705
	Acid Violet 34	61710
		61800
1085	Mordant Black 13	63615
1088	Solvent Blue 12	62100
	Acid Blue 78	62105
1089	Acid Blue 81	64510
1091	Solvent Red 52	68210
	Acid Red 80	68215
1096	Vat Orange 9	59700
1098	Vat Orange 2	59705/6
1099	Vat Blue 20	59800
1100	Vat Blue 18	59815
1101	Vat Green 1	59825/6
1102	Vat Green 9	59850
1104	Vat Violet 1	60010/11
1106	Vat Blue 4	69800/1
1109	Vat Blue 12	69840
1112	Vat Blue 14	69810
1113	Vat Blue 6	69825/6
1114	Pigment Blue 21	69835
1118	Vat Yellow 1	70600/1
1132	Vat Yellow 3	61725/6
1135	Vat Violet 17	63365
1150	Vat Black 27	69005
1151	Vat Brown 3	69015/16
1161	Vat Violet 14	67895
1162	Vat Red 35	68000
1163	Vat Violet 13	68700
1167	Vat Green 7	58825
1169	Vat Orange 21	69700
1170	Vat Yellow 21	69705
1173	Vat Blue 7	70305/6
1176	Vat Yellow 5	56005/6
1177	Vat Blue 1	73000
1178	Vat Blue 1	73001/2
1180	Acid Blue 74	73015
	Food Blue 1	73015
1183	Vat Blue 35	73060
1184	Vat Blue 5	73065/6
1185	Vat Blue 9	73071
1207	Vat Red 41	73300
1212	Vat Violet 2	73385/6
1217	Vat Orange 5	73335/6
1231	Natural Brown 1	75620
1232	Natural Yellow 11	75240
		75660
1233	Natural Yellow 10	75720
1239	Natural Red 4	75470
1243	Natural Red 24	75280
1246	Natural Black 1	75290
1249	Natural Brown 3	75250
1253	Natural Black 4	75291
1264	—	—
1288	Pigment Blue 27	77510
		77520
1291	Pigment Green 17	77288
1303	Natural Brown 8	—
1308	Pigment Black 6, 7	77266

II. Old Prototype Numbers to New Colour Index Names and Numbers

Old Prototype No.	*New CI Name*	*New CI No.*
1	Mordant Yellow 8	18821
2	Mordant Brown 17	—
3	Mordant Brown 35	14765
4	Mordant Brown 40	17590
7	Mordant Blue 9	14855
8	Basic Yellow 4	—
9	Vat Yellow 2	67300/1
10	Acid Blue 40	62125
11	Acid Blue 41	62130
12	Acid Blue 25	62055
13	Acid Green 22	42170
14	Mordant Brown 1	20110
19	Direct Red 16	27680
20	Direct Blue 26	31930
22	Direct Blue 151	24175
23	Direct Brown 26	31730
24	Direct Black 51	27720
26	Direct Blue 78	34200
27	Direct Blue 66	—
28	Direct Brown 106	36200
30-31	Direct Red 31	29100
32	Direct Violet 14	29105
33	Acid Blue 10	—
35	Direct Violet 9	27885
37	Acid Blue 15	42645
39	Acid Blue 109	42740
40	Acid Blue 104	42735
41	Disperse Black 7	11035
43	Disperse Orange 3	11005
46	Direct Blue 75	34220
47	Direct Brown 95	30145
48	Direct Orange 47	—
53	Direct Yellow 44	29000
54	Direct Yellow 41	29005
56	Mordant Yellow 10	14010
58	Disperse Black 2	11255
62	Disperse Blue 1	64500
63	Disperse Red 31	11250
64	Direct Black 36	31665
65	Sulfur Blue 15	53540
67	Direct Red 13	22155
68	Direct Brown 33	35520
69	Direct Brown 25	36030
70	Direct Brown 74	36300
71	Direct Blue 71	34140
72	Direct Orange 34	40215/20
73	Direct Orange 37	40265
74	Direct Blue 120	34085
	Direct Blue 120A	34090
77	Direct Red 149	29110
78	Direct Green 38	28280
79	Direct Red 122	29210
80	Direct Red 123	17820
81	Direct Orange 83	29090
82	Direct Brown 125	—
83	Direct Brown 132	31505
84	Direct Red 152	28360
85	Direct Red 153	28210
87	Direct Blue 133	34005
89	Direct Red 120	25275
90	Direct Blue 136	24065
91	Direct Blue 138	26650
93	Mordant Blue 13	16680
94	Azoic Diazo Comp 3	37010
95	Direct Red 111	40290
96	Direct Black 75	35870
97	Direct Orange 60	40215
99	Direct Yellow 27	13950
100	Acid Violet 12	18075
101	Acid Red 37	17045
102	Acid Red 34	17030
103	Pigment Yellow 1	11680
104	Pigment Yellow 5	11660
105	Pigment Yellow 3	11710
109	Vat Red 1	73360/1
112	Pigment Red 51	15580
116	Vat Orange 3	59300/1
118	Vat Brown 1	70800/1
121	Vat Brown 5	73410/11
122	Vat Green 8	71050
124	Vat Red 13	70320
126	Sulfur Black 6	53295
128	Acid Blue 98	50335
129	Sulfur Blue 15	53540
135	Mordant Red 19	18735
137	Acid Orange 50	13150
138	Acid Yellow 44	23900
139	Acid Yellow 38	25135
141	Acid Black 41	20480
143	Acid Black 52	15711
144	Acid Blue 158	14880
	Acid Blue 158A	15050
145	Acid Red 179	19351
146	Acid Orange 76	18870
147	Direct Black 80	31600
148	Acid Red 137	17755
149	Pigment Green 8	10006
151	Acid Orange 49	23260
152	Acid Orange 45	22195
157	Sulfur Orange 1	53050
162	Sulfur Brown 29	—
163	Azoic Blue 6	—
164	Azoic Blue 2	—
165	Azoic Red 16	—
168	Azoic Red 6	—
169	Azoic Red 2	—
170	Azoic Red 1	—
171	Azoic Yellow 1	—
172	Direct Red 127	28215
	Direct Red 127A	28240
173	Direct Orange 73	25200
174	Disperse Orange 7	11240
186	Acid Orange 56	22895
187	Acid Yellow 42	22910
188	Acid Red 32	17065
189	Acid Black 31	17580
190	Acid Blue 117	17055
191	Acid Violet 11	17060
192	Acid Brown 2	17605
193	Acid Red 35	18065
194	Acid Orange 19	14690
195	Acid Yellow 25	18835
197	Acid Violet 1	17025
198	Basic Blue 7	42595
	Pigment Blue 1	
	Solvent Blue 5	42595B
201	Direct Black 17	27700
202	Direct Black 78	30015
203	Mordant Brown 15	14870
205	Mordant Brown 22	14235
206	Acid Black 48	65005
207	Acid Blue 67	—
208	Direct Brown 30	17630
209	Acid Brown 1	10395
210	Acid Red 42	17070
211	Solvent Orange 5	18745A
213	Solvent Red 35	16260
		45170
215	Solvent Yellow 22	—
216	Solvent Yellow 19	13900A
217	Direct Red 77	28110
222	Acid Blue 83	42660
223	Acid Blue 90	42655
224	Acid Yellow 7	56205
227	Disperse Blue 9	61115
228	Disperse Blue 3	61505
229	Disperse Blue 7	62500
230	Disperse Orange 5	11100
231	Disperse Red 32	11190
234	Disperse Red 15	60710
235	Disperse Red 11	62015
236	Disperse Red 17	11210
237	Disperse Violet 1	61100
238	Disperse Red 13	11115
239	Disperse Red 5	11215
240	Disperse Violet 8	62030
241	Disperse Violet 4	61105

Old Prototype No.	New CI Name	New CI No.
242	Disperse Yellow 3	11855
243	Disperse Yellow 1	10345
244	Disperse Red 1	11110
245	Disperse Yellow 5	12790
246	Direct Red 80	35780
247	Mordant Orange 4	18940
249	Direct Yellow 8	13920
250	Direct Brown 138	31500
251	Direct Yellow 62	36900
252	Direct Yellow 61	—
253	Mordant Brown 19	14250
254	Mordant Green 26	18180
256	Azoic Diazo Comp 38	37190
257	Azoic Diazo Comp 23	37205
258	Azoic Diazo Comp 20	37175
259	Azoic Diazo Comp 40	37170
260	Azoic Diazo Comp 1	37135
261	Azoic Diazo Comp 39	37220
263	Azoic Diazo Comp 27	37215
264	Azoic Diazo Comp 2	37005
265	Azoic Diazo Comp 6	37025
266	Azoic Diazo Comp 49	—
267	Azoic Diazo Comp 36	37275
269	Azoic Diazo Comp 9	37040
270	Azoic Diazo Comp 32	37090
271	Azoic Diazo Comp 10	37120
272	Azoic Diazo Comp 34	37100
273	Azoic Diazo Comp 11	37085
274	Azoic Diazo Comp 41	37165
275	Azoic Diazo Comp 44	37000
276	Direct Orange 39	40215
277	Direct Violet 47	25410
278	Direct Blue 86	74180
280	Pigment Orange 1	11725
285	Sulfur Blue 10	53470
288	Vat Violet 9	60005
289	Vat Black 9	65230
290	Vat Orange 15	69025
291	Vat Yellow 4	59100/1
292	Vat Orange 1	59105/6
293	Vat Green 3	69500/1
295	Vat Black 1	73670/1
296	Vat Red 10	67000/1
298	Mordant Brown 63	—
299	Mordant Black 38	18160
301	Mordant Violet 20	—
302	Azoic Coupling Comp 2	37505
303	Azoic Coupling Comp 4	37560
304	Azoic Coupling Comp 3	37575
305	Azoic Coupling Comp 17	37515
306	Azoic Coupling Comp 18	37520
307	Azoic Coupling Comp 16	37605
308	Azoic Coupling Comp 10	37510
309	Azoic Coupling Comp 5	37610
310	Azoic Coupling Comp 12	37550
311	Azoic Coupling Comp 20	37530
312	Azoic Coupling Comp 11	37535
313	Azoic Coupling Comp 7	37565
314	Azoic Coupling Comp 8	37525
315	Acid Orange 74	18745
316	Acid Yellow 99	13900
317	Mordant Yellow 30	18710
318	Acid Blue 161	15706
321	Acid Green 12	13425
325	Acid Orange 72	18740
326	Acid Red 186	18810
327	Acid Red 180	18736
328	Acid Violet 56	16055
329	Acid Violet 58	16260
330	Acid Yellow 54	19010
333	Direct Orange 42	—
334	Azoic Orange 8	—
338	Azoic Yellow 4	—
339	Azoic Black 1	—
340	Azoic Brown 10	—
341	Azoic Blue 3	—
342	Azoic Blue 7	—
343	Azoic Brown 7	—
344	Azoic Brown 9	—
345	Azoic Yellow 3	—
347	Azoic Green 1	—
348	Azoic Orange 2	—
349	Azoic Orange 3	—
350	Azoic Violet 2	—
351	Azoic Violet 1	—
353	Azoic Yellow 2	—
357	Azoic Diazo Comp 35	37255
358	Azoic Diazo Comp 22	37240
360	Acid Red 133	17995
361	Acid Red 82	68205
364	Direct Brown 27	31725
365	Direct Brown 101	31740
366	Direct Violet 7	27855
367	Direct Violet 51	27905
368	Direct Green 11	27540
369	Disperse Yellow 11	56200
370	Disperse Red 4	60755
371	Direct Black 41	30260
372	Direct Black 22	35435
375	Mordant Black 7	16505
376	Direct Orange 75	17840
377	Direct Red 155	25210
	Direct Red 124	—
378	Azoic Diazo Comp 42	37150
379	Direct Black 71	25040
381	Vat Orange 4	59710/11
383	Basic Black 3	—
385	Azoic Coupling Comp 19	37545
386	Azoic Coupling Comp 36	37585
387	Azoic Coupling Comp 15	37600
388	Azoic Coupling Comp 13	37595
389	Acid Red 191	—
391	Acid Red 183	18800
392	Acid Red 184	15685
393	Direct Red 53	22405
397	Direct Brown 151	31685
398	Pigment Red 5	12490
402	Azoic Red 12	—
403	Azoic Red 9	—
404	Direct Red 148	25005
406	Pigment Violet 5	58055
407	Pigment Red 84	58210
408	Mordant Blue 54	16685
409	Vat Red 32	71135
410	Acid Blue 35	61560
411	Mordant Blue 19	—
412	Acid Red 57	—
416	Direct Black 74	34180
417	Direct Blue 55	27940
418	Acid Blue 99	—
420	Disperse Yellow 31	48000
421	Direct Red 100	—
422	Direct Red 99	—
423	Direct Brown 112	29166
425	Direct Green 26	34045
426	Direct Orange 38	—
427	Direct Orange 62	—
428	Direct Red 79	29065
429	Direct Violet 48	29125
430	Direct Violet 46	—
431	Direct Yellow 54	—
432	Direct Blue 76	—
433	Acid Brown 127	—
434	Acid Brown 129	—
435	Direct Orange 74	28255
436	Direct Blue 130	27110
438	Direct Red 121	28250
439	Direct Yellow 81	—
442	Azoic Diazo Comp 46	37080
443	Direct Blue 98	23155
446	Vat Orange 16	69540
447	Vat Brown 31	70695
448	Vat Brown 25	69020
449	Vat Red 29	71140
450	Vat Yellow 28	69000
451	Vat Yellow 9	66510
452	Vat Orange 11	70805
453	Acid Violet 14	17080
454	Mordant Blue 26	—
455	Mordant Blue 12	—
456	Mordant Brown 50	—
457	Mordant Orange 8	—
458	Mordant Red 36	—
459	Mordant Green 41	—
460	Azoic Coupling Comp 23	37555
461	Mordant Violet 1	43565
462	Acid Blue 154	—
463	Acid Orange 62	—
466	Azoic Brown 2	—
467	Azoic Yellow 6	—
469	Azoic Yellow 11	—
470	Direct Green 27	—
471	Solvent Red 22	21250
472	Solvent Yellow 29	21230
473	Sulphur Yellow 11	—
474	Acid Yellow 29	18900
475	Pigment Orange 13	21110
476	Pigment Red 38	21120
478	Pigment Yellow 14	21095
479	Pigment Yellow 13	21100
481	Pigment Blue 15	74160
482	Pigment Blue 16	74100
483	Pigment Green 7	74260
484	Mordant Violet 11	43550
485	Acid Blue 23	61125
487	Solvent Black 19	—
488	Solvent Red 8	12715
489	Acid Blue 103	42120
490	Direct Orange 62	—
491	Direct Red 83	29225
492	Direct Yellow 8	13920

Old Prototype No.	New CI Name	New CI No.
493	Direct Red 133	—
494	Direct Red 141	25240
495	Direct Yellow 64	—
496	Direct Red 86	—
498	Azoic Diazo Comp 24	37155
499	Azoic Diazo Comp 43	37160
501	Azoic Diazo Comp 28	37151
502	†Vat Blue 6	†69825
503	Vat Violet 3	73395/6
504	Basic Brown 3	—
505	Azoic Coupling Comp 35	37615
506	Azoic Coupling Comp 24	37540
507	†Acid Red 212	—
508	Acid Red 194	—
509	Acid Red 212	—
511	Azoic Violet 3	—
513	Acid Orange 28	16240
514	Mordant Black 26	—
516	Acid Blue 69	—
517	Solvent Yellow 13	—
518	Pigment Yellow 12	21090
519	Acid Black 15	—
520	Solvent Orange 20	—
521	Acid Orange 34	—
522	Vat Blue 16	71200
523	Disperse Black 9	—
524	Direct Blue 61	—
525	Direct Blue 18	—
526	Direct Yellow 39	—
527	Mordant Green 9	19515
528	Vat Blue 41	73040
529	Direct Blue 126	34010
530	Direct Green 51	34260
531	Direct Violet 67	—
532	Direct Red 139	—
533	Direct Yellow 5	—
534	Disperse Yellow 2	—
535	Direct Blue 74	—
536	Direct Orange 48	—
537	Disperse Yellow 33	—
538	Disperse Blue 33	—
539	Direct Red 32	28395
540	Azoic Diazo Comp 21	37200
541	Pigment Red 4	12085
542	Solvent Green 4	45550
	Fluorescent Brightening Agent 74	
545	Sulfur Brown 14	53246
546	Sulfur Violet 4	53700
547	Vat Black 25	69525/6
548	Vat Blue 32	67910
549	Vat Yellow 12	65405
550	Vat Yellow 25	—
551	Disperse Orange 17	—
552	Basic Brown 2	21030
553	Solvent Green 2	—
	Solvent Green 11	—
554	Solvent Blue 38	—
555	Azoic Coupling Comp 33	37620
556	Azoic Coupling Comp 29	37527
557	Azoic Coupling Comp 14	37558
558	Azoic Coupling Comp 25	37590
559	Azoic Coupling Comp 34	37531
560	Acid Green 35	13361
562	Acid Orange 51	26550
563	Pigment Red 48	15865
565	Direct Black 37	—
	Direct Black 8	—
566	Direct Brown 111	—
567	Direct Orange 76	—
568	Direct Orange 79	—
569	Direct Blue 24	—
570	Solvent Green 7	59040
571	Azoic Black 4	—
572	Azoic Blue 5	—
574	Direct Brown 100	35800
575	Direct Red 84	35760
576	Direct Orange 41	40235
577	Direct Red 76	40270
578	Direct Orange 72	—
579	Acid Brown 13	10410
580	Azoic Diazo Comp 47	37250
582	Direct Yellow 50	29025
583	Disperse Yellow 23	—
584	Mordant Brown 21	19600
586	Developer 5	37500
587	Developer 8	—
590	Acid Orange 60	—
591	Acid Red 182	—
593	†Vat Black 18	—
594	Direct Blue 81	34215
595	Direct Brown 163	—
596	Direct Blue 162	35770
597	Developer 1	—
598	Acid Orange 2	—
602	Developer 14	76035

† Similar to but not identical

Old Prototype No.	New CI Name	New CI No.
603	Mordant Blue 7	17940
604	Azoic Coupling Comp 21	37526
605	Acid Brown 42	14251
606	Direct Blue 180	—
607	Acid Red 119	—
608	Azoic Black 3	—
609	Direct Violet 49	—
610	Solvent Black 3	26150
611	Direct Blue 100	—
613	Direct Blue 80	—
615	Acid Blue 80	61585
616	Direct Green 28	14155
617	Mordant Black 8	—
619	Disperse Blue 27	—
621	Disperse Red 20	—
622	Vat Brown 20	—
623	Vat Blue 29	74140
626	Direct Orange 88	—
630	Disperse Black 1	11365
631	Acid Green 41	62560
632	Vat Green 2	59830/1
633	Acid Blue 51	62145
634	Mordant Brown 61	16070
635	Disperse Orange 13	26080
636	Disperse Orange 15	10350
637	Disperse Orange 1	11080
638	Disperse Orange 11	60700
639	Disperse Red 9	60505
640	Disperse Violet 6	61140
641	Disperse Violet 13	11195
642	Disperse Blue 19	61110
643	Acid Orange 31	15995
644	Acid Green 15	42105
645	Acid Blue 29	20460
646	Acid Red 104	26420
647	Azoic Coupling Comp 9	37625
648	Acid Red 31	16540
649	Acid Red 133	17995
650	Acid Black 16	20345
651	Pigment Red 55	15820
652	Acid Red 40	18070
656	Solvent Orange 18	45371
657	Pigment Orange 5	12075
658	Solvent Red 27	26125
659	Solvent Red 42	45366
661	Pigment Red 18	12350
662	Pigment Red 100	13058
663	Pigment Orange 16	21160
664	Pigment Red 41	21200
666	Direct Orange 71	40205
668	Azoic Diazo Comp 51	37195
669	Azoic Diazo Comp 19	37065
670	Azoic Diazo Comp 14	37100
671	Azoic Diazo Comp 33	37075
672	Food Green 3	42053
673	Food Red 1	14700
674	Food Yellow 3	15985
675	Direct Blue 175	35465
676	Direct Blue 176	35460
677	Direct Blue 177	22625
678	Direct Brown 190	31750
679	Direct Green 21	31790
680	Direct Red 191	17900
681	Direct Red 189	28400
682	Direct Violet 85	22520
683	Direct Violet 83	25280
684	Vat Brown 24 and 34	56010
685	Vat Yellow 10	65430
686	Pigment Red 87	73310
687	Acid Red 5	14905
688	Acid Green 7	42055
689	Fluorescent Brightening Agent 32	40620
690	Fluorescent Brightening Agent 30	40600
691	Pigment Green 10	12775
692	Azoic Coupling Comp 27	37516
693	Azoic Coupling Comp 22	37511
694	Azoic Coupling Comp 30	37559
695	Azoic Coupling Comp 31	37521
696	Solvent Red 26	26120
697	Pigment Orange 2	12060
698	Fluorescent Brightening Agent 2	40630
	Fluorescent Brightening Agent 1	40630
699	Pigment Blue 25	21180
700	Direct Orange 40	40265
701	Pigment Red 15	12465
702	Sulphur Red 5	53830
703	Solvent Yellow 30	21240
705	Acid Black 47	56055
706	Sulphur Green 8	53175
707	Sulphur Green 1	53166
708	Pigment Red 23	12355
709	Pigment Brown 2	12071
710	Fluorescent Brightening Agent 41	49015
711	Pigment Yellow 13	21100
712	Direct Blue 23	24405

† Similar to but not identical

III. New Colour Index Names and Numbers to Old Names and Numbers

ACID DYES

New CI Name*		New CI No.	Old CI Name	Old CI No.
Acid Black	1	20470	Naphthol Blue Black	CI 246
Acid Black	2	50420	Nigrosine	CI 865
Acid Black	3	27260	—	—
Acid Black	4	—	—	—
Acid Black	5	27510	—	—
Acid Black	6	—	—	—
Acid Black	7	26300	Naphthylamine Black D	CI 308
Acid Black	8	—	—	—
Acid Black	9	—	—	—
Acid Black	10	—	—	—
Acid Black	11	—	—	—
Acid Black	12	—	(Buffalo Black AR)	—
Acid Black	13	—	(Buffalo Black RB)	—
Acid Black	14	—	—	—
Acid Black	15	—	(Buffalo Black 3G)	Pr 519
Acid Black	16	20345	(†Buffalo Black GRF Conc)	†Pr 650
Acid Black	17	20350	—	—
Acid Black	18	27790	Acid Black N	CI 294
Acid Black	19	—	—	—
Acid Black	20	27065	—	—
Acid Black	21	26405	—	—
Acid Black	22	—	—	—
Acid Black	23	27230	—	—
Acid Black	24	26370	Sulphon Cyanine Black B	CI 307
Acid Black	25	—	—	—
Acid Black	26	27070	Nerol 2B	†CI 304
Acid Black	26A	27075	Nerol 2B	†CI 304
Acid Black	26B	26690	Nerol 2B	CI 304
Acid Black	27	26310	—	—
Acid Black	28	20500	—	—
Acid Black	29	—	—	—
Acid Black	30	—	—	—
Acid Black	31	17580	Supramine Black BR	Pr 189
Acid Black	32	26990	Fast Sulphon Black F	CI 306
Acid Black	33	—	—	—
Acid Black	34	15715	—	—
Acid Black	35	26320	Sulphon Black R	CI 271
Acid Black	36	27275	—	—
Acid Black	37	—	—	—
Acid Black	38	—	—	—
Acid Black	39	—	—	—
Acid Black	40	—	—	—
Acid Black	41	20480	Naphthol Blue Black S	Pr 141
Acid Black	42	—	—	—
Acid Black	43	15691	—	—
Acid Black	44	—	—	—
Acid Black	45	—	—	—
Acid Black	46	—	—	—
Acid Black	47	56055	Sulfonine Gray G	Pr 705
Acid Black	48	65005	Alizarin Fast Gray BBLW	Pr 206
Acid Black	49	—	—	—
Acid Black	50	—	—	—
Acid Black	51	16711	—	—
Acid Black	52	15711	Neolan Black WA	Pr 143
Acid Black	53	—	(Chromolan Gray G)	—
Acid Black	54	14885	—	—
Acid Black	55	—	—	—
Acid Black	56	—	—	—
Acid Black	57	—	—	—
Acid Black	58	—	—	—
Acid Black	59	—	—	—
Acid Black	60	—	—	—
Acid Black	61	—	—	—
Acid Black	62	—	—	—
Acid Black	63	—	—	—
Acid Black	64	—	—	—
Acid Black	65	—	—	—
Acid Black	66	—	—	—
Acid Black	67	—	—	—
Acid Black	68	—	—	—
Acid Black	69	30260	Chrome Leather Fast Black S	—
Acid Black	70	30355	—	—
Acid Black	71	—	—	—
Acid Black	72	—	—	—
Acid Black	73	—	—	—
Acid Black	74	—	—	—
Acid Black	75	—	—	—
Acid Black	76	—	—	—
Acid Black	77	—	—	—
Acid Black	78	—	—	—
Acid Black	79	—	—	—
Acid Black	80	—	—	—
Acid Black	81	—	—	—
Acid Black	82	20265	—	—
Acid Black	83	—	—	—
Acid Black	84	17560	—	—
Acid Black	85	—	—	—
Acid Black	86	—	—	—
Acid Black	87	—	—	—
Acid Black	88	—	—	—
Acid Black	89	—	—	—
Acid Black	90	—	—	—
Acid Black	91	—	—	—
Acid Black	92	—	(Calcofast Gray G)	—
Acid Black	93	35075	—	—
Acid Black	94	—	—	—
Acid Black	95	—	—	—
Acid Black	96	—	—	—
Acid Blue	1	42045	Xylene Blue VS	CI 672
Acid Blue	2	—	—	—
Acid Blue	3	42051	Patent Blue V	CI 712
Acid Blue	4	16595	—	—
Acid Blue	5	42052	Patent Blue A	CI 714
Acid Blue	6	17185	—	—
Acid Blue	7	42080	Xylene Blue AS	CI 673
Acid Blue	8	58800	—	—
Acid Blue	9	42090	Erioglaucine	CI 671
Acid Blue	10	—	Brilliant Acid Blue 3B	Pr 33
Acid Blue	11	42155	—	—
Acid Blue	12	—	—	—
Acid Blue	13	42571	Fast Acid Violet 10B	CI 696
Acid Blue	14	—	—	—
Acid Blue	15	42645	Brilliant Milling Blue B	Pr 37
Acid Blue	16	—	(Wool Blue CGG)	—
Acid Blue	17	42625	—	—
Acid Blue	18	50230	Acid Cyanine	CI 853
Acid Blue	19	45205	—	—
Acid Blue	20	50405	Induline	CI 861
Acid Blue	21	18120	—	—
Acid Blue	22	42755	Soluble Blue	CI 707
Acid Blue	23	61125	Alizarin Light Blue 4GL	Pr 485
Acid Blue	24	42730	—	—
Acid Blue	25	62055	Alizarin Supra Blue A	Pr 12
Acid Blue	26	—	(Alphazurine B)	—
Acid Blue	27	61530	Alizarin Astrol B	CI 1075
Acid Blue	28	—	—	—
Acid Blue	29	20460	(Amacid Navy Blue B)	Pr 645
Acid Blue	30	—	—	—
Acid Blue	31	—	—	—
Acid Blue	32	—	—	—
Acid Blue	33	—	(Pharmacine Blue G)	—
Acid Blue	34	42561	Acid Violet 4BN	CI 695
Acid Blue	35	61560	Alizarin Supra Blue SES	Pr 410
Acid Blue	36	—	—	—
Acid Blue	37	—	—	—
Acid Blue	38	—	—	—
Acid Blue	39	—	—	—
Acid Blue	40	62125	Alizarin Direct Blue A2G	Pr 10
Acid Blue	41	62130	Alizarin Direct Blue AR	Pr 11
Acid Blue	42	17255	—	—
Acid Blue	43	63000	Alizarin Saphirol SE	CI 1053
Acid Blue	44	21640	—	—
Acid Blue	45	63010	Alizarin Saphirol B	CI 1054
Acid Blue	46	—	(Anthraquinone Blue 3G)	—
Acid Blue	47	62085	Cyananthrol R	CI 1076
Acid Blue	48	42770	Methyl Blue	CI 705
Acid Blue	49	62095	—	—
Acid Blue	50	—	—	—

† Similar to but not identical.

*This column also includes the prototype names of many foreign dyes introduced since the old *CI* was published; also the names of domestic dyes which have no foreign Prototypes. The latter dyes are in parentheses.

New CI Name		New CI No.	Old CI Name	Old CI No.
Acid Blue	51	62145	(Alizarine Levelling Blue 2R)	Pr 633
Acid Blue	52	—	—	—
Acid Blue	53	62135	—	—
Acid Blue	54	—	—	—
Acid Blue	55	63315	—	—
Acid Blue	56	62005	—	—
Acid Blue	57	—	—	—
Acid Blue	58	—	(Anthraquinone Blue 2GA)	—
Acid Blue	59	50315	Wool Fast Blue	CI 833
Acid Blue	60	—	—	—
Acid Blue	61	50330	—	—
Acid Blue	62	62045	—	—
Acid Blue	63	—	(Alizarine Sapphire EMM)	—
Acid Blue	64	—	(Alizarine Sapphire RL)	—
Acid Blue	65	—	(Anthraquinone Violet A)	—
Acid Blue	66	—	—	—
Acid Blue	67	—	Alizarin Supra Sky R	Pr 207
Acid Blue	68	63330	—	—
Acid Blue	69	—	Alizarin Saphirol WSA	Pr 516
Acid Blue	70	17000	—	—
Acid Blue	71	—	—	—
Acid Blue	72	—	—	—
Acid Blue	73	—	(Apochrome Blue G)	—
Acid Blue	74	73015	Indigotin 1A	CI 1180
Acid Blue	75	42576	Eriocyanine A	CI 699
Acid Blue	76	—	—	—
Acid Blue	77	—	—	—
Acid Blue	78	62105	Alizarin Sky Blue B	CI 1088
Acid Blue	79	—	(Anthraquinone Blue RA)	—
Acid Blue	80	61585	—	—
Acid Blue	81	64510	Anthraquinone Blue SR Ex	CI 1089
Acid Blue	82	—	—	—
Acid Blue	83	42660	Brilliant Indocyanine 6B-CF	Pr 222
Acid Blue	84	—	—	—
Acid Blue	85	25735	—	—
Acid Blue	86	44075	—	—
Acid Blue	87	20415	—	—
Acid Blue	88	—	—	—
Acid Blue	89	13405	Sulphon Acid Blue B	CI 209
Acid Blue	90	42655	Brilliant Indocyanine G	Pr 223
Acid Blue	91	42715	—	—
Acid Blue	92	13390	Sulphon Acid Blue R	CI 208
Acid Blue	93	42780	Methyl Cotton Blue	CI 706
Acid Blue	94	—	—	—
Acid Blue	95	—	—	—
Acid Blue	96	62110	—	—
Acid Blue	97	—	—	—
Acid Blue	98	50335	Indocyanine B	Pr 128
Acid Blue	99	—	Brilliant Wool Blue G Ex	Pr 418
Acid Blue	100	42675	—	—
Acid Blue	101	—	—	—
Acid Blue	102	50320	Wool Fast Blue	CI 833
Acid Blue	103	42120	Brilliant Indo Blue 5GL	Pr 489
Acid Blue	104	42735	Brilliant Wool Blue FFR	Pr 40
Acid Blue	105	—	—	—
Acid Blue	106	—	—	—
Acid Blue	107	—	—	—
Acid Blue	108	44035	—	—
Acid Blue	109	42740	Brilliant Wool Blue FFB	Pr 39
Acid Blue	110	42750	Alkali Blue	CI 704
Acid Blue	111	62155	—	—
Acid Blue	112	—	—	—
Acid Blue	113	26360	Sulphon Cyanine 5R Ex	CI 289
Acid Blue	114	26361	—	—
Acid Blue	115	—	—	—
Acid Blue	116	26380	Sulphon Cyanine G	CI 288
Acid Blue	117	17055	Supramine Blue R	Pr 190
Acid Blue	118	26410	Sulphon Cyanine G	CI 288
Acid Blue	119	42765	—	—
Acid Blue	120	26400	Sulphon Cyanine 5R Ex	CI 289
Acid Blue	121	50310	—	—
Acid Blue	122	—	(Anthraquinone Milling Blue BL)	—
Acid Blue	123	44510	—	—
Acid Blue	124	64005	—	—
Acid Blue	125	—	—	—
Acid Blue	126	—	—	—
Acid Blue	127	61135	—	—
Acid Blue	128	20435	—	—
Acid Blue	129	—	—	—
Acid Blue	130	—	—	—
Acid Blue	131	—	—	—
Acid Blue	132	—	—	—
Acid Blue	133	—	—	—
Acid Blue	134	—	—	—
Acid Blue	135	13385	—	—
Acid Blue	136	—	—	—
Acid Blue	137	—	(Alizarine Blue GS)	—
Acid Blue	138	62075	—	—
Acid Blue	139	—	—	—
Acid Blue	140	—	—	—
Acid Blue	141	—	—	—
Acid Blue	142	—	—	—
Acid Blue	143	—	—	—
Acid Blue	144	—	—	—
Acid Blue	145	62070	—	—
Acid Blue	146	—	—	—
Acid Blue	147	42135	—	—
Acid Blue	148	—	—	—
Acid Blue	149	—	—	—
Acid Blue	150	61130	—	—
Acid Blue	151	—	—	—
Acid Blue	152	—	—	—
Acid Blue	153	—	—	—
Acid Blue	154	—	Neolan Blue 2R	Pr 462
Acid Blue	155	14641	—	—
Acid Blue	156	—	—	—
Acid Blue	157	—	—	—
Acid Blue	158	14880	Neolan Blue GG	Pr 144
Acid Blue	158A	15050	Neolan Blue GG	Pr 144
Acid Blue	159	—	(Palatine Fast Blue 5RNA-CF)	—
Acid Blue	160	—	—	—
Acid Blue	161	15706	Palatine Fast Blue BN	Pr 318
Acid Blue	162	—	—	—
Acid Blue	163	—	—	—
Acid Blue	164	—	—	—
Acid Blue	165	—	(Capracyl Blue G)	—
Acid Blue	166	—	—	—
Acid Blue	167	—	—	—
Acid Blue	168	—	—	—
Acid Blue	169	15025	—	—
Acid Blue	170	—	—	—
Acid Blue	171	—	—	—
Acid Blue	172	—	—	—
Acid Blue	173	—	—	—
Acid Brown	1	10395	Amido Naphthol Brown 3G	Pr 209
Acid Brown	2	17605	Supramine Brown R	Pr 192
Acid Brown	3	14610	—	—
Acid Brown	4	14805	—	—
Acid Brown	5	20095	—	—
Acid Brown	6	14625	Naphthylamine Brown	CI 175
Acid Brown	7	—	—	—
Acid Brown	8	13000	—	—
Acid Brown	9	17165	—	—
Acid Brown	10	—	—	—
Acid Brown	11	—	—	—
Acid Brown	12	—	—	—
Acid Brown	13	10410	Supranol Brown 3GL	Pr 579
Acid Brown	14	20195	Resorcin Dark Brown	CI 235
Acid Brown	15	20190	—	—
Acid Brown	16	17610	—	—
Acid Brown	17	20111	—	—
Acid Brown	18	—	—	—
Acid Brown	19	—	—	—
Acid Brown	20	17640	—	—
Acid Brown	21	—	—	—
Acid Brown	22	—	(Pontacyl Fast Brown CGS)	—
Acid Brown	23	—	—	—
Acid Brown	24	—	—	—
Acid Brown	25	—	(Alizarine Brown RL)	—
Acid Brown	26	65000	—	—
Acid Brown	27	66710	—	—
Acid Brown	28	—	—	—
Acid Brown	29	—	(Capracyl Brown RD)	—
Acid Brown	30	—	—	—
Acid Brown	31	—	(Acid Alizarine Brown RLL)	—
Acid Brown	32	23000	—	—
Acid Brown	33	—	—	—
Acid Brown	34	—	—	—
Acid Brown	35	—	—	—
Acid Brown	36	—	(Alizarine Light Brown BL)	—
Acid Brown	37	—	—	—
Acid Brown	38	—	—	—
Acid Brown	39	—	—	—
Acid Brown	40	—	—	—
Acid Brown	41	—	(Neutral Brown RD)	—
Acid Brown	42	14251	Neolan Brown R	Pr 605
Acid Brown	43	20300	—	—
Acid Brown	44	—	—	—
Acid Brown	45	—	—	—
Acid Brown	46	—	—	—
Acid Brown	47	—	—	—
Acid Brown	48	—	—	—
Acid Brown	49	—	—	—
Acid Brown	50	—	—	—
Acid Brown	51	—	—	—
Acid Brown	52	—	—	—
Acid Brown	53	—	—	—
Acid Brown	54	—	—	—
Acid Brown	55	—	—	—
Acid Brown	56	—	—	—
Acid Brown	57	—	—	—
Acid Brown	58	—	—	—
Acid Brown	59	—	—	—
Acid Brown	60	—	—	—
Acid Brown	61	—	—	—
Acid Brown	62	—	—	—
Acid Brown	63	—	—	—
Acid Brown	64	—	—	—
Acid Brown	65	—	—	—
Acid Brown	66	—	—	—

New CI Name		New CI No.	Old CI Name	Old CI No.
Acid Brown	67	—	—	—
Acid Brown	68	—	—	—
Acid Brown	69	—	—	—
Acid Brown	70	—	—	—
Acid Brown	71	—	—	—
Acid Brown	72	—	—	—
Acid Brown	73	—	—	—
Acid Brown	74	—	—	—
Acid Brown	75	34905	—	—
Acid Brown	76	—	—	—
Acid Brown	77	—	—	—
Acid Brown	78	—	—	—
Acid Brown	79	—	—	—
Acid Brown	80	—	—	—
Acid Brown	81	—	—	—
Acid Brown	82	—	—	—
Acid Brown	83	20250	—	—
Acid Brown	84	20255	—	—
Acid Brown	85	34900	—	—
Acid Brown	86	17620	—	—
Acid Brown	87	17596	—	—
Acid Brown	88	17595	—	—
Acid Brown	89	17570	—	—
Acid Brown	90	17100	—	—
Acid Brown	91	17550	—	—
Acid Brown	92	36020	—	—
Acid Brown	93	—	—	—
Acid Brown	94	—	—	—
Acid Brown	95	—	—	—
Acid Brown	96	—	(Calcofast Brown FN)	—
Acid Brown	97	—	(Calcofast Brown MF)	—
Acid Brown	98	—	(Calcofast Olive Brown G)	—
Acid Brown	99	—	—	—
Acid Brown	100	—	—	—
Acid Brown	101		—	—
Acid Brown	102	14615	—	—
Acid Brown	103	10415	—	—
Acid Brown	104	—	—	—
Acid Brown	105	33530	—	—
Acid Brown	106	—	—	—
Acid Brown	107	—	—	—
Acid Brown	108	—	—	—
Acid Brown	109	—	—	—
Acid Brown	110	—	—	—
Acid Brown	111	—	—	—
Acid Brown	112	—	—	—
Acid Brown	113	—	—	—
Acid Brown	114	—	—	—
Acid Brown	115	—	—	—
Acid Brown	116	—	—	—
Acid Brown	117	—	—	—
Acid Brown	118	—	—	—
Acid Brown	119	35025	—	—
Acid Brown	120	35020	—	—
Acid Brown	121	33520	—	—
Acid Brown	122	33525	—	—
Acid Brown	123	35030	—	—
Acid Brown	124	—	—	—
Acid Brown	125	—	—	—
Acid Brown	126	—	—	—
Acid Brown	127	—	Derma Brown G Conc	Pr 433
Acid Brown	128	—	—	—
Acid Brown	129	—	Derma Brown R Conc	Pr 434
Acid Brown	130	—	—	—
Acid Brown	131	—	—	—
Acid Brown	132	—	—	—
Acid Brown	133	—	—	—
Acid Brown	134	—	—	—
Acid Brown	135	—	—	—
Acid Brown	136	—	—	—
Acid Brown	137	—	—	—
Acid Brown	138	—	—	—
Acid Brown	139	—	—	—
Acid Brown	140	—	—	—
Acid Brown	141	—	—	—
Acid Brown	142	—	—	—
Acid Brown	143	20260	—	—
Acid Brown	144	14295	—	—
Acid Brown	145	13280	—	—
Acid Brown	146	26531	—	—
Acid Brown	147	—	—	—
Acid Brown	148	—	—	—
Acid Brown	149	—	—	—
Acid Brown	150	—	—	—
Acid Brown	151	—	—	—
Acid Brown	152	—	(Igenal Brown CRTA)	—
Acid Brown	153	—	(Igenal Brown ITGA)	—
Acid Brown	154	—	(Igenal Brown PGMA)	—
Acid Brown	155	—	(Igenal Brown PRMA)	—
Acid Brown	156	—	—	—
Acid Brown	157	—	—	—
Acid Brown	158	—	(Indian Brown 3G)	—
Acid Brown	159	—	—	—
Acid Brown	160	—	—	—
Acid Brown	161	—	—	—
Acid Brown	162	—	—	—
Acid Brown	163	—	—	—
Acid Brown	164	—	—	—
Acid Brown	165	—	—	—
Acid Brown	166	—	—	—
Acid Brown	167	—	—	—
Acid Brown	168	—	—	—
Acid Brown	169	—	—	—
Acid Brown	170	—	—	—
Acid Brown	171	—	—	—
Acid Brown	172	—	—	—
Acid Brown	173	—	—	—
Acid Brown	174	—	—	—
Acid Brown	175	—	—	—
Acid Brown	176	—	—	—
Acid Brown	177	—	—	—
Acid Brown	178	—	—	—
Acid Brown	179	—	—	—
Acid Brown	180	—	—	—
Acid Brown	181	—	—	—
Acid Brown	182	—	—	—
Acid Brown	183	—	—	—
Acid Brown	184	—	—	—
Acid Brown	185	—	—	—
Acid Brown	186	—	—	—
Acid Brown	187	—	—	—
Acid Brown	188	—	—	—
Acid Brown	189	—	—	—
Acid Brown	190	—	—	—
Acid Brown	191	—	—	—
Acid Brown	192	—	—	—
Acid Brown	193	—	—	—
Acid Brown	194	—	—	—
Acid Brown	195	—	—	—
Acid Brown	196	—	—	—
Acid Brown	197	—	—	—
Acid Brown	198	—	—	—
Acid Brown	199	—	—	—
Acid Brown	200	—	—	—
Acid Brown	201	—	—	—
Acid Brown	202	—	—	—
Acid Brown	203	—	—	—
Acid Brown	204	—	—	—
Acid Brown	205	—	—	—
Acid Brown	206	—	—	—
Acid Brown	207	—	—	—
Acid Brown	208	—	—	—
Acid Brown	209	—	—	—
Acid Brown	210	—	—	—
Acid Brown	211	10425	—	—
Acid Brown	212	10380	—	—
Acid Green	1	10200	Naphthol Green B	CI 5
Acid Green	2	18775	—	—
Acid Green	3	42085	Guinea Green B	CI 666
Acid Green	4	10025	—	—
Acid Green	5	42095	Light Green SF Yellowish	CI 670
Acid Green	6	42075	—	—
Acid Green	7	42055	Kiton Green A	Pr 688
Acid Green	8	42050	—	—
Acid Green	9	42100	Brilliant Milling Green B	CI 667
Acid Green	10	—	(Alizarine Cyanine Green 4G)	—
Acid Green	11	42038	Fast Green Ex Bluish	CI 691
Acid Green	12	13425	Palatine Fast Green BLN	Pr 321
Acid Green	13	42046	—	—
Acid Green	14	42047	—	—
Acid Green	15	42105	(Amacid Milling Green 3G)	Pr 644
Acid Green	16	44025	Naphtalin Green V	CI 735
Acid Green	17	—	—	—
Acid Green	18	42155	—	—
Acid Green	19	20440	—	—
Acid Green	20	20495	Azo Dark Green A	CI 247
Acid Green	21	—	—	—
Acid Green	22	42170	Alkali Fast Green 10G	Pr 13
Acid Green	23	—	—	—
Acid Green	24	—	—	—
Acid Green	25	61570	Alizarin Cyanine Green	CI 1078
Acid Green	26	—	—	—
Acid Green	27	61580	—	—
Acid Green	28	—	—	—
Acid Green	29	—	—	—
Acid Green	30	—	—	—
Acid Green	31	—	—	—
Acid Green	32	—	—	—
Acid Green	33	33545	—	—
Acid Green	34	27520	—	—
Acid Green	35	13361	Neolan Dark Green B	Pr 560
Acid Green	36	61595	—	—
Acid Green	37	62515	—	—
Acid Green	38	62550	—	—
Acid Green	39	—	—	—
Acid Green	40	—	—	—
Acid Green	41	62560	(Ahcoquinone Brill Cyanine Green 5GX)	Pr 631
Acid Green	42	62575	—	—
Acid Green	43	—	—	—
Acid Green	44	61590	—	—
Acid Green	45	13420	—	—
Acid Green	46	—	—	—
Acid Green	47	—	—	—

New CI Name	New CI No.	Old CI Name	Old CI No.
Acid Green	48	—	—
Acid Green	49	—	—
Acid Green	50	44090 Wool Green S	CI 737
Acid Orange	1	13090 Azoflavine RS	CI 145
Acid Orange	1	13091 Azoflavine RS	CI 145
Acid Orange	2	— (Erio Fast Orange F)	Pr 598
Acid Orange	3	10385 Amido Yellow E	CI 11
Acid Orange	4	28690 —	—
Acid Orange	5	13080 —	—
Acid Orange	6	14270 Tropaeolin O	CI 148
Acid Orange	7	15510 Orange II	CI 151
Acid Orange	8	15575 Orange R	CI 161
Acid Orange	9	17925 —	—
Acid Orange	10	16230 Orange G	CI 27
Acid Orange	11	45370 —	—
Acid Orange	12	15970 Crocein Orange G	CI 26
Acid Orange	13	— —	—
Acid Orange	14	16100 —	—
Acid Orange	15	50120 —	—
Acid Orange	16	16011 —	—
Acid Orange	17	16020 —	—
Acid Orange	18	16120 —	—
Acid Orange	19	14690 Supramine Red 2G	Pr 194
Acid Orange	20	14600 Orange I	CI 150
Acid Orange	21	— —	—
Acid Orange	22	— —	—
Acid Orange	23	15540 —	—
Acid Orange	24	20170 Resorcin Brown	CI 234
Acid Orange	25	20160 —	—
Acid Orange	26	— —	—
Acid Orange	27	17750 —	—
Acid Orange	28	16240 Xylene Fast Orange PO	Pr 513
Acid Orange	29	— —	—
Acid Orange	30	17770 —	—
Acid Orange	31	15995 (Amacid Fast Orange LW)	Pr 643
Acid Orange	32	— (Pharmacine Orange 2R)	—
Acid Orange	33	24780 —	—
Acid Orange	34	— (Calcofast Wool Orange RN)	Pr 521
Acid Orange	35	— —	—
Acid Orange	36	— —	—
Acid Orange	37	— —	—
Acid Orange	38	— —	—
Acid Orange	39	— —	—
Acid Orange	40	— —	—
Acid Orange	41	16015 —	—
Acid Orange	42	— —	—
Acid Orange	43	— —	—
Acid Orange	44	— —	—
Acid Orange	45	22195 Polar Orange R	Pr 152
Acid Orange	46	— —	—
Acid Orange	47	— —	—
Acid Orange	48	— —	—
Acid Orange	49	23260 Polar Orange GS	Pr 151
Acid Orange	50	13150 Milling Orange G	Pr 137
Acid Orange	51	26550 Neutral Brown RX	Pr 562
Acid Orange	52	13025 Methyl Orange	CI 142
Acid Orange	53	— —	—
Acid Orange	54	— (Calcocid Milling Orange 4R)	—
Acid Orange	55	24765 —	—
Acid Orange	56	22895 Sulphon Orange G	Pr 186
Acid Orange	57	— —	—
Acid Orange	58	— —	—
Acid Orange	59	— (Milling Orange RN)	—
Acid Orange	60	— (Capracyl Orange R)	Pr 590
Acid Orange	61	19320 —	—
Acid Orange	62	— Neolan Orange GRE	Pr 463
Acid Orange	63	— Polar Yellow R	—
Acid Orange	63	— (Supranol Yellow RA)	—
Acid Orange	64	— (Capracyl Yellow 3RD)	—
Acid Orange	65	— —	—
Acid Orange	66	— —	—
Acid Orange	67	— —	—
Acid Orange	68	— —	—
Acid Orange	69	— (Calcofast Orange YF)	—
Acid Orange	70	— —	—
Acid Orange	71	— —	—
Acid Orange	72	18740 Palatine Fast Orange RN	Pr 325
Acid Orange	73	— —	—
Acid Orange	74	18745 Neolan Orange G	Pr 315
Acid Orange	75	— —	—
Acid Orange	76	18870 Neolan Orange R	Pr 146
Acid Orange	77	— —	—
Acid Orange	78	— —	—
Acid Orange	79	23255 —	—
Acid Orange	80	— —	—
Acid Orange	81	— —	—
Acid Orange	82	— —	—
Acid Orange	83	— —	—
Acid Orange	84	— —	—
Acid Orange	85	— —	—
Acid Orange	86	— —	—
Acid Orange	87	— —	—
Acid Orange	88	— —	—
Acid Orange	89	— —	—
Acid Red	1	18050 Amido Naphthol Red G	CI 31
Acid Red	2	13020 —	—
Acid Red	3	14910 —	—
Acid Red	4	14710 Azo Eosine G	CI 114 †
Acid Red	5	14905 Kiton Fast Red R	Pr 687
Acid Red	6	14680 —	—
Acid Red	7	14895 Sorbine Red	CI 54
Acid Red	8	14900 —	—
Acid Red	9	15635 —	—
Acid Red	10	15640 —	—
Acid Red	11	16040 —	—
Acid Red	12	14835 Diamond Blue 3B	CI 180
Acid Red	13	16045 —	—
Acid Red	14	14720 Azo Rubine	CI 179
Acid Red	15	17930 —	—
Acid Red	16	14920 —	—
Acid Red	17	16180 Fast Red B	CI 88
Acid Red	18	16255 Cochineal Red A	CI 185
Acid Red	19	16605 —	—
Acid Red	20	14830 —	—
Acid Red	21	14965 †Eosamine G	CI 119
Acid Red	22	14940 —	—
Acid Red	23	16130 —	—
Acid Red	24	16140 —	—
Acid Red	25	16050 Crocein Scarlet 3BX	CI 183
Acid Red	26	16150 Ponceau R	CI 79
Acid Red	27	16185 Amaranth	CI 184
Acid Red	28	— —	—
Acid Red	29	16570 Chromotrop 2R	CI 29
Acid Red	30	17035 —	—
Acid Red	31	16540 (Azo Fuchsine GA)	Pr 648
Acid Red	32	17065 Supra Light Rubine BL	Pr 188
Acid Red	33	17200 Fast Acid Fuchsine B	CI 30
Acid Red	34	17030 Guinea Fast Red 4BL	Pr 102
Acid Red	35	18065 Supramine Red 3B	Pr 193
Acid Red	36	— (Anocid Fast Red IR)	—
Acid Red	37	17045 Guinea Fast Red BL	Pr 101
Acid Red	38	— —	—
Acid Red	39	— (Fast Brilliant Crimson RB)	—
Acid Red	40	18070 (Seresine B)	Pr 652
Acid Red	40	18070 (Calcocid Ceresine)	Pr 652
Acid Red	41	16290 —	—
Acid Red	42	17070 Anthralan Red B-CF	Pr 210
Acid Red	43	— —	—
Acid Red	44	16250 —	—
Acid Red	45	— —	—
Acid Red	46	— —	—
Acid Red	47	27300 —	—
Acid Red	48	— —	—
Acid Red	49	— —	—
Acid Red	50	45220 —	—
Acid Red	51	45430 Erythrosine Bluish	CI 773
Acid Red	52	45100 Sulpho Rhodamine B	CI 748
Acid Red	53	13055 —	—
Acid Red	54	17020 —	—
Acid Red	55	— —	—
Acid Red	56	27180 —	—
Acid Red	57	— Azo Rubinol 3GP	Pr 412
Acid Red	58	— —	—
Acid Red	59	— —	—
Acid Red	60	16645 —	—
Acid Red	61	— —	—
Acid Red	62	— —	—
Acid Red	63	— —	—
Acid Red	64	— (Fast Crimson R)	—
Acid Red	65	24830 —	—
Acid Red	66	26905 Ponceau 3RB	CI 280
Acid Red	67	— —	—
Acid Red	68	17920 —	—
Acid Red	69	— —	—
Acid Red	70	27155 —	—
Acid Red	71	27165 —	—
Acid Red	72	— —	—
Acid Red	73	27290 Brilliant Crocein M	CI 252
Acid Red	74	13355 —	—
Acid Red	75	— —	—
Acid Red	76	18115 Brilliant Sulphon Red	CI 32
Acid Red	77	— —	—
Acid Red	78	— —	—
Acid Red	79	— —	—
Acid Red	80	68215 Alizarin Rubinol R	CI 1091
Acid Red	81	68200 —	—
Acid Red	82	68205 Alizarin Rubinol 3G	Pr 361
Acid Red	83	68220 —	—
Acid Red	84	— —	—
Acid Red	85	22245 Polar Red	CI 430
Acid Red	86	24500 —	—
Acid Red	87	45380 Eosine G	CI 768
Acid Red	88	15620 Fast Red A	CI 176
Acid Red	89	23910 Acid Anthracene Red 3B	CI 487
Acid Red	90	— —	—
Acid Red	91	45400 Eosine B	CI 771
Acid Red	92	45410 Phloxine B	CI 778
Acid Red	93	45435 —	—
Acid Red	94	45440 Rose Bengale B	CI 779
Acid Red	95	45425 Erythrosine Yellowish	CI 772
Acid Red	96	— (Milling Fast Red FF)	—
Acid Red	97	22890 Acid Anthracene Red G	CI 443
Acid Red	98	45405 —	—

† Similar to but not identical

New CI Name	New CI No.	Old CI Name	Old CI No.
Acid Red 99	23285	Polar Red	CI 430
Acid Red 100	—	(Pharmacine Scarlet G)	—
Acid Red 101	50085	—	—
Acid Red 102	14730	—	—
Acid Red 103	50090	—	—
Acid Red 104	26420	(Amacid Neutral Red 3G)	Pr 646
Acid Red 105	—	—	—
Acid Red 106	18110	Brilliant Sulphon Red	CI 32
Acid Red 107	18025	—	—
Acid Red 108	18000	—	—
Acid Red 109	—	(Pharmatex Red B)	—
Acid Red 110	18020	—	—
Acid Red 111	23265	—	—
Acid Red 112	—	—	—
Acid Red 113	—	(Azo Eosine 2B)	—
Acid Red 114	23635	—	—
Acid Red 115	27200	Cloth Red B	CI 262
Acid Red 116	26660	Cloth Red G	CI 249
Acid Red 117	—	—	—
Acid Red 118	—	—	—
Acid Red 119	—	Polar Red Brown V	Pr 607
Acid Red 120	—	—	—
Acid Red 121	—	—	—
Acid Red 122	—	—	—
Acid Red 123	—	—	—
Acid Red 124	—	—	—
Acid Red 125	—	—	—
Acid Red 126	—	—	—
Acid Red 127	—	—	—
Acid Red 128	24125	—	—
Acid Red 129	—	—	—
Acid Red 130	—	—	—
Acid Red 131	—	—	—
Acid Red 132	—	—	—
Acid Red 133	17995	(Sulfonine Brilliant Red B)	Pr 649
Acid Red 133	17995	(Brilliant Milling Red B)	Pr 649
Acid Red 134	24810	Polar Red	CI 430
Acid Red 135	14695	—	—
Acid Red 136	—	—	—
Acid Red 137	17755	Paper Red A Extra	Pr 148
Acid Red 138	—	—	—
Acid Red 139	—	—	—
Acid Red 140	—	—	—
Acid Red 141	15625	—	—
Acid Red 142	27000	—	—
Acid Red 143	—	—	—
Acid Red 144	22900	—	—
Acid Red 145	—	—	—
Acid Red 146	—	—	—
Acid Red 147	—	—	—
Acid Red 148	26665	—	—
Acid Red 149	—	—	—
Acid Red 150	27190	Ponceau SS Ex	CI 253
Acid Red 151	26900	Cloth Scarlet G	CI 275
Acid Red 152	23010	—	—
Acid Red 153	—	—	—
Acid Red 154	24800	—	—
Acid Red 155	18130	—	—
Acid Red 156	—	—	—
Acid Red 157	17990	—	—
Acid Red 158	20530	—	—
Acid Red 159	—	—	—
Acid Red 160	18150	—	—
Acid Red 161	18035	—	—
Acid Red 162	—	(Pharmatex Red G)	—
Acid Red 163	24790	—	—
Acid Red 164	23250	—	—
Acid Red 165	—	(Pharmacine Red 3B)	—
Acid Red 166	—	—	—
Acid Red 167	—	Polar Red	CI 430
Acid Red 168	—	—	—
Acid Red 169	—	—	—
Acid Red 170	27210	—	—
Acid Red 171	—	—	—
Acid Red 172	18135	—	—
Acid Red 173	23290	—	—
Acid Red 174	—	—	—
Acid Red 175	—	(Pontacyl Ruby PL)	—
Acid Red 176	16575	—	—
Acid Red 177	27015	Cloth Red G Ex	CI 261
Acid Red 178	—	(Capracyl Red BB)	—
Acid Red 179	19351	Neolan Bordeaux R	Pr 145
Acid Red 180	18736	Palatine Fast Red RN	Pr 327
Acid Red 181	—	—	—
Acid Red 182	—	(Capracyl Red B)	Pr 591
Acid Red 183	18800	Neolan Red GRE	Pr 391
Acid Red 184	15685	Neolan Violet Brown B	Pr 392
Acid Red 185	—	—	—
Acid Red 186	18810	Palatine Fast Pink BN	Pr 326
Acid Red 187	16265	—	—
Acid Red 188	—	—	—
Acid Red 189	—	(Calcofast Wool Bordeaux BN)	—
Acid Red 190	—	(Calcofast Wool Bordeaux RB)	—
Acid Red 191	—	Neolan Pink B	Pr 389
Acid Red 192	—	(Neolan Pink G)	—
Acid Red 193	—	—	—
Acid Red 194	—	Neolan Bordeaux RM	Pr 508
Acid Red 195	—	—	—
Acid Red 196	—	—	—
Acid Red 197	—	(Chromacyl Brilliant Pink 3B)	—
Acid Red 198	19115	—	—
Acid Red 199	—	—	—
Acid Red 200	—	—	—
Acid Red 201	18761	—	—
Acid Red 202	—	—	—
Acid Red 203	—	—	—
Acid Red 204	—	—	—
Acid Red 205	—	—	—
Acid Red 206	—	—	—
Acid Red 207	—	(Chromolan Red 3RB)	—
Acid Red 208	—	—	—
Acid Red 209	—	—	—
Acid Red 210	—	—	—
Acid Red 211	—	—	—
Acid Red 212	—	†Neolan Bordeaux BE	†Pr 507
Acid Red 212	—	Neolan Red BRE	Pr 509
Acid Red 213	—	—	—
Acid Red 214	19355	—	—
Acid Red 215	—	—	—
Acid Red 216	—	—	—
Acid Red 217	—	—	—
Acid Red 218	—	—	—
Acid Red 219	—	—	—
Acid Red 220	—	—	—
Acid Red 221	—	—	—
Acid Red 222	—	—	—
Acid Red 223	—	—	—
Acid Red 224	—	—	—
Acid Red 225	—	—	—
Acid Red 226	—	—	—
Acid Red 227	—	—	—
Acid Red 228	—	—	—
Acid Red 229	—	—	—
Acid Red 230	—	—	—
Acid Red 231	17040	—	—
Acid Red 232	—	—	—
Acid Red 233	—	—	—
Acid Red 234	—	—	—
Acid Red 235	—	—	—
Acid Red 236	—	—	—
Acid Red 237	—	—	—
Acid Red 238	—	—	—
Acid Violet 1	17025	Victoria Fast Violet 2R Ex	Pr 197
Acid Violet 2	17190	—	—
Acid Violet 3	16580	Victoria Violet 4BS	CI 53
Acid Violet 4	—	—	—
Acid Violet 5	18125	—	—
Acid Violet 6	16600	Chromotrop 6B	CI 56
Acid Violet 7	18055	Amido Naphthol Red 6B	CI 57
Acid Violet 8	—	—	—
Acid Violet 9	45190	Violamine R	CI 758
Acid Violet 10	—	—	—
Acid Violet 11	17060	Supramine Bordeaux B	Pr 191
Acid Violet 12	18075	Guinea Carmine B	Pr 100
Acid Violet 13	16640	Chromotrop 10B	CI 90
Acid Violet 14	17080	Kiton Fast Red 4BL	Pr 453
Acid Violet 15	43525	Acid Violet 6B	CI 717
Acid Violet 16	42560	—	—
Acid Violet 17	42650	Formyl Violet S4B	CI 698
Acid Violet 18	—	—	—
Acid Violet 19	42685	Acid Magenta	CI 692
Acid Violet 20	16625	—	—
Acid Violet 21	42580	—	—
Acid Violet 22	—	—	—
Acid Violet 23	42680	—	—
Acid Violet 24	44055	—	—
Acid Violet 25	42745	—	—
Acid Violet 26	—	—	—
Acid Violet 27	13455	—	—
Acid Violet 28	—	—	—
Acid Violet 29	—	(Calcocid Fast Violet 3R)	—
Acid Violet 29	—	(Hastings Light Fast Violet 3RL)	—
Acid Violet 30	45186	Violamine B	CI 757
Acid Violet 31	—	—	—
Acid Violet 32	—	—	—
Acid Violet 33	—	—	—
Acid Violet 34	61710	Anthraquinone Violet	CI 1080
Acid Violet 34	61800	Anthraquinone Violet	CI 1080
Acid Violet 35	—	—	—
Acid Violet 36	62010	—	—
Acid Violet 37	—	—	—
Acid Violet 38	—	—	—
Acid Violet 39	68500	—	—
Acid Violet 40	—	(Nyasol Fast Violet B)	—
Acid Violet 41	62020	—	—
Acid Violet 42	62026	—	—
Acid Violet 43	60730	Alizarin Irisol R	CI 1073
Acid Violet 44	—	—	—
Acid Violet 45	—	—	—

† Similar to but not identical.

New CI Name		New CI No.	Old CI Name	Old CI No.
Acid Violet	46	—	—	—
Acid Violet	47	—	—	—
Acid Violet	48	—	—	—
Acid Violet	49	42640	Acid Violet 6B	CI 697
Acid Violet	50	50325	—	—
Acid Violet	51	62165	—	—
Acid Violet	52	—	—	—
Acid Violet	53	—	—	—
Acid Violet	54	—	—	—
Acid Violet	55	—	—	—
Acid Violet	56	16055	Palatine Fast Violet 3RN	Pr 328
Acid Violet	57	—	—	—
Acid Violet	58	16260	Palatine Fast Violet 5RN	Pr 329
Acid Violet	59	—	—	—
Acid Violet	60	—	—	—
Acid Violet	61	—	—	—
Acid Violet	62	14646	—	—
Acid Violet	63	62160	—	—
Acid Violet	64	—	—	—
Acid Violet	65	—	—	—
Acid Violet	66	—	—	—
Acid Violet	67	18005	—	—
Acid Violet	68	—	—	—
Acid Violet	69	—	—	—
Acid Violet	70	—	—	—
Acid Violet	71	—	—	—
Acid Violet	72	42665	—	—
Acid Violet	73	—	—	—
Acid Violet	74	—	—	—
Acid Violet	75	—	—	—
Acid Violet	76	—	(Alizarine Violet XRR)	—
Acid Violet	77	—	—	—
Acid Violet	78	—	—	—
Acid Violet	79	—	(Chromolan Violet 2R)	—
Acid Violet	80	—	—	—
Acid Yellow	1	10316	Naphthol Yellow S	CI 10
Acid Yellow	2	47010	Quinoline Yellow KT	CI 802
Acid Yellow	3	47005	Quinoline Yellow	CI 801
Acid Yellow	4	18695	—	—
Acid Yellow	5	47035	(Chinoline Yellow Extra)	—
Acid Yellow	6	13100	—	—
Acid Yellow	7	56205	Brilliant Sulpho Flavine FFA	Pr 224
Acid Yellow	8	—	—	—
Acid Yellow	9	13015	Fast Yellow	CI 16
Acid Yellow	10	—	—	—
Acid Yellow	11	18820	Fast Light Yellow	CI 636
Acid Yellow	12	18830	—	—
Acid Yellow	13	19120	—	—
Acid Yellow	14	18960	—	—
Acid Yellow	15	—	—	—
Acid Yellow	16	13085	—	—
Acid Yellow	17	18965	Xylene Light Yellow	CI 639
Acid Yellow	18	19020	—	—
Acid Yellow	19	—	—	—
Acid Yellow	20	14225	—	—
Acid Yellow	21	14230	—	—
Acid Yellow	22	—	—	—
Acid Yellow	23	19140	Tartrazine	CI 640
Acid Yellow	24	10315	—	—
Acid Yellow	25	18835	Supramine Yellow R	Pr 195
Acid Yellow	26	13105	—	—
Acid Yellow	27	19130	(Kiton Yellow S)	—
Acid Yellow	28	—	—	—
Acid Yellow	29	18900	Supramine Yellow 3GL	Pr 474
Acid Yellow	30	—	—	—
Acid Yellow	31	—	—	—
Acid Yellow	32	—	—	—
Acid Yellow	33	13115	—	—
Acid Yellow	34	18890	Fast Light Yellow	†CI 636
Acid Yellow	35	—	(Pharmacine Yellow 3G)	—
Acid Yellow	36	13065	Metanil Yellow	CI 138
Acid Yellow	37	—	—	—
Acid Yellow	38	25135	Milling Yellow O	Pr 139
Acid Yellow	39	—	—	—
Acid Yellow	40	18950	Polar Yellow 5G	CI 642
Acid Yellow	41	19025	—	—
Acid Yellow	42	22910	Sulphon Yellow R	Pr 187
Acid Yellow	43	—	—	—
Acid Yellow	44	23900	Milling Yellow H5G	Pr 138
Acid Yellow	45	—	—	—
Acid Yellow	46	—	—	—
Acid Yellow	47	—	—	—
Acid Yellow	48	18970	—	—
Acid Yellow	49	—	—	—
Acid Yellow	50	—	—	—
Acid Yellow	51	—	—	—
Acid Yellow	52	—	—	—
Acid Yellow	53	18915	—	—
Acid Yellow	54	19010	Palatine Fast Yellow ELN	Pr 330
Acid Yellow	55	19040	—	—
Acid Yellow	56	24825	—	—
Acid Yellow	57	—	—	—
Acid Yellow	58	—	—	—
Acid Yellow	59	—	—	—
Acid Yellow	60	—	(Canary Lake Yellow PL)	—
Acid Yellow	61	—	—	—
Acid Yellow	62	—	—	—
Acid Yellow	63	13095	Azo Yellow	CI 146
Acid Yellow	64	—	—	—
Acid Yellow	65	14170	Azoflavine RS	CI 145
Acid Yellow	66	13200	—	—
Acid Yellow	67	—	—	—
Acid Yellow	68	23270	—	—
Acid Yellow	69	13135	—	—
Acid Yellow	70	—	—	—
Acid Yellow	71	—	—	—
Acid Yellow	72	—	—	—
Acid Yellow	73	45350	Uranine	CI 766
Acid Yellow	74	45360	—	—
Acid Yellow	75	—	—	—
Acid Yellow	76	18850	—	—
Acid Yellow	77	—	(Calcofast Yellow 2G)	—
Acid Yellow	78	—	—	—
Acid Yellow	79	—	—	—
Acid Yellow	80	—	—	—
Acid Yellow	81	—	—	—
Acid Yellow	82	—	(Milling Yellow GN)	—
Acid Yellow	83	—	—	—
Acid Yellow	84	—	—	—
Acid Yellow	85	—	—	—
Acid Yellow	86	23310	—	—
Acid Yellow	87	22905	—	—
Acid Yellow	88	—	—	—
Acid Yellow	89	—	—	—
Acid Yellow	90	—	(Milling Yellow XN)	—
Acid Yellow	91	—	—	—
Acid Yellow	92	—	—	—
Acid Yellow	93	—	—	—
Acid Yellow	94	—	—	—
Acid Yellow	95	—	(Neutral Silk Yellow CGA)	—
Acid Yellow	96	—	—	—
Acid Yellow	97	—	—	—
Acid Yellow	98	14006	—	—
Acid Yellow	99	13900	Neolan Yellow GR Conc	Pr 316
Acid Yellow	100	14091	—	—
Acid Yellow	101	—	—	—
Acid Yellow	102	—	—	—
Acid Yellow	103	—	—	—
Acid Yellow	104	—	—	—
Acid Yellow	105	—	—	—
Acid Yellow	106	18670	—	—
Acid Yellow	107	—	—	—
Acid Yellow	108	—	—	—
Acid Yellow	109	—	—	—
Acid Yellow	110	—	—	—
Acid Yellow	111	—	—	—
Acid Yellow	112	—	—	—
Acid Yellow	113	—	—	—
Acid Yellow	114	—	—	—
Acid Yellow	115	—	—	—
Acid Yellow	116	—	—	—
Acid Yellow	117	24820	—	—
Acid Yellow	118	—	—	—
Acid Yellow	119	—	—	—

† Similar to but not identical.

AZOIC COMPOSITIONS

New CI Name		New CI No.	Old CI Name	Old CI No.
Azoic Black	1	—	Rapidogen Black MG	Pr 339
Azoic Black	2	—	(Diagen Black MR)	—
Azoic Black	3	—	Rapidogen Black IT	Pr 608
Azoic Black	4	—	Rapidogen Black 3G	Pr 571
Azoic Black	5	—	—	—
Azoic Black	6	—	—	—
Azoic Blue	1	—	—	—
Azoic Blue	2	—	—	Pr 164
Azoic Blue	3	—	—	Pr 341
Azoic Blue	4	—	(Rapidogen Navy Blue FFR)	—
Azoic Blue	4	—	(Pharmol Navy Blue F Ex)	—
Azoic Blue	5	—	—	Pr 572
Azoic Blue	6	—	—	Pr 163
Azoic Blue	7	—	—	Pr 342
Azoic Blue	8	—	—	—
Azoic Blue	9	—	—	—
Azoic Blue	10	—	—	—
Azoic Blue	11	—	—	—
Azoic Blue	12	—	—	—
Azoic Blue	13	—	—	—
Azoic Blue	14	—	—	—
Azoic Blue	15	—	—	—
Azoic Blue	16	—	—	—
Azoic Blue	17	—	—	—
Azoic Blue	18	—	—	—
Azoic Blue	19	—	—	—

New CI Name	New CI No.	Old CI Name	Old CI No.
Azoic Blue	20	—	—
Azoic Blue	21	—	—
Azoic Blue	23	—	—
Azoic Blue	24	—	—
Azoic Brown	1	(Diagen Dark Brown AR)	—
Azoic Brown	2	Rapidogen Brown IR	Pr 466
Azoic Brown	3	—	—
Azoic Brown	4	—	—
Azoic Brown	5	—	—
Azoic Brown	6	—	—
Azoic Brown	7	Rapidogen Brown IB	Pr 343
Azoic Brown	8	—	—
Azoic Brown	9	Rapidogen Brown IPT	Pr 344
Azoic Brown	10	Rapidogen Black Brown IT	Pr 340
Azoic Brown	11	—	—
Azoic Brown	12	—	—
Azoic Brown	13	—	—
Azoic Brown	14	—	—
Azoic Brown	15	—	—
Azoic Brown	16	—	—
Azoic Brown	17	—	—
Azoic Brown	18	—	—
Azoic Brown	19	—	—
Azoic Brown	20	—	—
Azoic Brown	21	—	—
Azoic Brown	22	—	—
Azoic Brown	23	—	—
Azoic Brown	24	—	—
Azoic Green	1	Rapidogen Green B	Pr 347
Azoic Orange	1	—	—
Azoic Orange	2	Rapidogen Orange G	Pr 348
Azoic Orange	3	Rapidogen Orange R	Pr 349
Azoic Orange	4	(Rapidogen Orange FFR)	—
Azoic Orange	5	—	—
Azoic Orange	6	—	—
Azoic Orange	7	—	—
Azoic Orange	8	Rapid Fast Orange RH	Pr 334
Azoic Orange	9	(Diagen Orange MG)	—
Azoic Orange	10	—	—
Azoic Orange	11	—	—
Azoic Orange	12	—	—
Azoic Orange	13	—	—
Azoic Orange	14	—	—
Azoic Orange	15	—	—
Azoic Orange	16	—	—
Azoic Orange	17	—	—
Azoic Orange	18	—	—
Azoic Orange	19	—	—
Azoic Red	1	Rapidogen Scarlet RS	Pr 170
Azoic Red	2	Rapidogen Red RS	Pr 169
Azoic Red	3	—	—
Azoic Red	4	—	—
Azoic Red	5	—	—
Azoic Red	6	Rapidogen Red GS	Pr 168
Azoic Red	7	—	—
Azoic Red	8	—	—
Azoic Red	9	Rapidogen Scarlet IL	Pr 403
Azoic Red	10	(Rapidogen Scarlet FFR)	—
Azoic Red	11	—	—
Azoic Red	12	Rapidogen Red ITR	Pr 402
Azoic Red	13	(Diagen Red AFR)	—
Azoic Red	13	(Rapidogen Red FFR-CF)	—
Azoic Red	14	(Rapidogen Red FFG)	—
Azoic Red	15	(Pharmasol Red 2BN)	—
Azoic Red	15	(Pharmol Red 2BN)	—
Azoic Red	15	(Rapidogen Red FFBB)	—
Azoic Red	16	Rapidogen Bordeau R	Pr 165
Azoic Red	17	—	—
Azoic Red	18	—	—
Azoic Red	19	—	—
Azoic Red	20	—	—
Azoic Red	21	—	—
Azoic Red	22	(Pharmasol Scarlet RR)	—
Azoic Red	22	(Pharmol Scarlet RR)	—
Azoic Red	23	—	—
Azoic Red	24	—	—
Azoic Red	25	—	—
Azoic Red	26	—	—
Azoic Red	27	—	—
Azoic Red	28	—	—
Azoic Red	29	—	—
Azoic Red	30	—	—
Azoic Red	31	—	—
Azoic Red	32	—	—
Azoic Red	33	—	—
Azoic Red	34	—	—
Azoic Red	35	—	—
Azoic Red	36	—	—
Azoic Red	37	—	—
Azoic Red	38	—	—
Azoic Red	39	—	—
Azoic Red	40	—	—
Azoic Red	41	—	—
Azoic Red	42	—	—
Azoic Red	43	—	—
Azoic Red	44	—	—
Azoic Red	45	—	—
Azoic Red	46	—	—
Azoic Red	47	—	—
Azoic Red	48	—	—
Azoic Red	49	—	—
Azoic Red	50	—	—
Azoic Red	51	—	—
Azoic Red	52	—	—
Azoic Red	53	—	—
Azoic Red	54	—	—
Azoic Red	55	—	—
Azoic Red	56	—	—
Azoic Red	57	—	—
Azoic Red	58	—	—
Azoic Red	59	—	—
Azoic Red	60	—	—
Azoic Red	61	—	—
Azoic Red	62	—	—
Azoic Red	63	—	—
Azoic Red	64	—	—
Azoic Violet	1	Rapidogen Violet B	Pr 351
Azoic Violet	2	Rapidogen Red Violet RR	Pr 350
Azoic Violet	3	Rapidogen Corinth IB	Pr 511
Azoic Violet	4	—	—
Azoic Violet	5	—	—
Azoic Violet	6	—	—
Azoic Violet	7	—	—
Azoic Violet	8	—	—
Azoic Yellow	1	Rapidogen Yellow G	Pr 171
Azoic Yellow	2	Rapidogen Yellow GG	Pr 353
Azoic Yellow	3	Rapidogen Golden Yellow R	Pr 345
Azoic Yellow	4	Rapid Fast Yellow GGH	Pr 338
Azoic Yellow	5	—	—
Azoic Yellow	6	Rapidogen Golden Yellow IFG	Pr 467
Azoic Yellow	7	—	—
Azoic Yellow	8	—	—
Azoic Yellow	9	—	—
Azoic Yellow	10	—	—
Azoic Yellow	11	Rapidogen Yellow I4G	Pr 469
Azoic Yellow	12	—	—
Azoic Yellow	13	—	—
Azoic Yellow	14	—	—
Azoic Yellow	15	—	—
Azoic Yellow	16	—	—
Azoic Yellow	17	—	—
Azoic Yellow	18	—	—
Azoic Yellow	19	—	—
Azoic Yellow	20	—	—
Azoic Yellow	21	—	—

AZOIC COUPLING COMPONENTS

New CI Name	New CI No.	Old CI Name	Old CI No.
Azoic Coupling Component	1 37500	Beta Naphthol	Pr 586
Azoic Coupling Component	2 37505	Naphthol AS	Pr 302
Azoic Coupling Component	3 37575	Naphthol AS-BR	Pr 304
Azoic Coupling Component	4 37560	Naphthol AS-BO	Pr 303
Azoic Coupling Component	5 37610	Naphthol AS-G	Pr 309
Azoic Coupling Component	6 37532	—	—
Azoic Coupling Component	7 37565	Naphthol AS-SW	Pr 313
Azoic Coupling Component	8 37525	Naphthol AS-TR	Pr 314
Azoic Coupling Component	9 37625	Naphthol AS-L4G	Pr 647
Azoic Coupling Component	10 37510	Naphthol AS-E	Pr 308
Azoic Coupling Component	11 37535	Naphthol AS-RL	Pr 312
Azoic Coupling Component	12 37550	Naphthol AS-ITR	Pr 310
Azoic Coupling Component	13 37595	Naphthol AS-SG	Pr 388
Azoic Coupling Component	14 37558	Naphthol AS-PH	Pr 557
Azoic Coupling Component	15 37600	Naphthol AS-LB	Pr 387
Azoic Coupling Component	16 37605	Naphthol AS-DB	Pr 307
Azoic Coupling Component	17 37515	Naphthol AS-BS	Pr 305
Azoic Coupling Component	18 37520	Naphthol AS-D	Pr 306
Azoic Coupling Component	19 37545	Naphthol AS-BG	Pr 385
Azoic Coupling Component	20 37530	Naphthol AS-OL	Pr 311

New CI Name		New CI No.	Old CI Name	Old CI No.
Azoic Coupling Component	21	37526	Naphthol AS-KB	Pr 604
Azoic Coupling Component	22	37511	(Naphthol AS-MCA)	Pr 693
Azoic Coupling Component	23	37555	Naphthol AS-LC	Pr 460
Azoic Coupling Component	24	37540	Naphthol AS-LT	Pr 506
Azoic Coupling Component	25	37590	Naphthol AS-SR	Pr 558
Azoic Coupling Component	26	—	—	—
Azoic Coupling Component	27	37516	(Naphthol AS-AN)	Pr 692
Azoic Coupling Component	28	—	—	—
Azoic Coupling Component	29	37527	Naphthol AS-MX	Pr 556
Azoic Coupling Component	30	37559	(Naphthol AS-RP)	Pr 694
Azoic Coupling Component	31	37521	(Naphthol AS-RT)	Pr 695
Azoic Coupling Component	32	37580	—	—
Azoic Coupling Component	33	37620	Naphthol AS-L3G	Pr 555
Azoic Coupling Component	34	37531	Naphthol NEL	Pr 559
Azoic Coupling Component	35	37615	Naphthol AS-LG	Pr 505
Azoic Coupling Component	36	37585	Naphthol AS-GR	Pr 386
Azoic Coupling Component	37	—	—	—
Azoic Coupling Component	38	—	—	—
Azoic Coupling Component	39	—	—	—
Azoic Coupling Component	40	37570	—	—
Azoic Coupling Component	41	37531	—	—
Azoic Coupling Component	42	—	—	—
Azoic Coupling Component	43	—	(Naphthol AS-BN)	—
Azoic Coupling Component	44	—	—	—
Azoic Coupling Component	45	37566	—	—
Azoic Coupling Component	46	37559	—	—
Azoic Coupling Component	100	—	—	—
Azoic Coupling Component	101	—	—	—
Azoic Coupling Component	102	—	—	—
Azoic Coupling Component	103	—	—	—
Azoic Coupling Component	104	—	—	—
Azoic Coupling Component	105	—	—	—

AZOIC DIAZO COMPONENTS

New CI Name		New CI No.	Old CI Name	Old CI No.
Azoic Diazo Component	1	37135	Fast Bordeaux GP Base, Salt	Pr 260
Azoic Diazo Component	2	37005	Fast Orange GC Base, Salt	Pr 264
Azoic Diazo Component	3	37010	Fast Scarlet 2G Base, Salt	Pr 94
Azoic Diazo Component	4	37210	Fast Garnet GBC Base, Salt	CI 17
Azoic Diazo Component	5	37125	Fast Red B Base	CI 117
Azoic Diazo Component	6	37025	Fast Orange GR Base, Salt	Pr 265
Azoic Diazo Component	7	37030	Fast Orange R Base, Salt	CI 69
Azoic Diazo Component	8	37110	Fast Red G Base, Salt	CI 69
Azoic Diazo Component	9	37040	Fast Red 3GL Base, Salt	Pr 269
Azoic Diazo Component	10	37120	Fast Red RC Base, Salt	Pr 271
Azoic Diazo Component	11	37085	Fast Red TR Base, Salt	Pr 273
Azoic Diazo Component	12	37105	Fast Scarlet G Base, Salt	CI 68
Azoic Diazo Component	13	37130	Fast Scarlet R Base, Salt	CI 118
Azoic Diazo Component	14	37100	Fast Ponceau L Base, Salt	Pr 670
Azoic Diazo Component	15	37180	—	—
Azoic Diazo Component	16	37045	—	—
Azoic Diazo Component	17	37055	—	—
Azoic Diazo Component	18	37060	—	—
Azoic Diazo Component	19	37065	Fast Golden Orange GR Salt	Pr 669
Azoic Diazo Component	20	37175	Fast Blue BB Base, Salt	Pr 258
Azoic Diazo Component	21	37200	Fast Brown Salt VA	Pr 540
Azoic Diazo Component	22	37240	Variamine Blue RT Salt	Pr 358
Azoic Diazo Component	23	37205	Fast Black LB Base	Pr 257
Azoic Diazo Component	24	37155	Fast Blue RR Base, Salt	Pr 498
Azoic Diazo Component	25	—	—	—
Azoic Diazo Component	26	37070	—	—
Azoic Diazo Component	27	37215	Fast Garnet GC Base, Salt	Pr 263
Azoic Diazo Component	28	37151	Fast Red PDC Base, Salt	Pr 501
Azoic Diazo Component	29	37140	—	—
Azoic Diazo Component	30	—	—	—
Azoic Diazo Component	31	37145	—	—
Azoic Diazo Component	32	37090	Fast Red KB Base, Salt	Pr 270
Azoic Diazo Component	33	37075	Fast Red FR Salt	Pr 671
Azoic Diazo Component	34	37100	Fast Red RL Base, Salt	Pr 272
Azoic Diazo Component	35	37255	Variamine Blue BD Salt	Pr 357
Azoic Diazo Component	36	37275	Fast Red AL Salt	Pr 267
Azoic Diazo Component	37	37035	Fast Red 2G Base, Salt	CI 44
Azoic Diazo Component	38	37190	Fast Black K Salt	Pr 256
Azoic Diazo Component	39	37220	Fast Corinth V Salt	Pr 261
Azoic Diazo Component	40	37170	Fast Bordeaux BD Salt	Pr 259
Azoic Diazo Component	41	37165	Fast Violet B Base, Salt	Pr 274
Azoic Diazo Component	42	37150	Fast Red ITR Base, Salt	Pr 378
Azoic Diazo Component	43	37160	Fast Corinth LB Salt	Pr 499
Azoic Diazo Component	44	37000	Fast Yellow GC Base, Salt	Pr 275
Azoic Diazo Component	45	37260	—	—
Azoic Diazo Component	46	37080	Fast Scarlet TR Base	Pr 442
Azoic Diazo Component	47	37250	Variamine Blue FG Salt	Pr 580
Azoic Diazo Component	48	37235	Fast Blue B Base, Salt	CI 499
Azoic Diazo Component	49	—	Fast Orange RD Salt	Pr 266
Azoic Diazo Component	50	—	—	—
Azoic Diazo Component	51	37195	Fast Dark Blue R Salt	Pr 668
Azoic Diazo Component	100	—	—	—
Azoic Diazo Component	101	—	—	—
Azoic Diazo Component	102	—	—	—
Azoic Diazo Component	103	—	—	—
Azoic Diazo Component	104	—	—	—
Azoic Diazo Component	105	—	—	—
Azoic Diazo Component	106	—	—	—
Azoic Diazo Component	107	—	—	—
Azoic Diazo Component	108	—	—	—

BASIC DYES

New CI Name		New CI No.	Old CI Name	Old CI No.
Basic Black	1	50431	Methylene Gray	CI 873
Basic Black	2	11825	—	—
Basic Black	3	—	Janus Black G	Pr 383
Basic Black	4	—	—	—
Basic Black	5	—	—	—
Basic Blue	1	42025	Setoglaucine	CI 658
Basic Blue	2	—	(Brilliant Basic Blue DSC)	—
Basic Blue	3	51005	—	—
Basic Blue	4	51004	—	—
Basic Blue	5	42140	Setocyanine	CI 663
Basic Blue	6	51175	New Blue R	CI 909
Basic Blue	7	42595	Victoria Pure Blue B	Pr 198
Basic Blue	8	42563	—	—
Basic Blue	9	52015	Methylene Blue	CI 922
Basic Blue	10	51190	—	—
Basic Blue	11	44040	Victoria Blue R	CI 728
Basic Blue	12	51180	Nile Blue A	CI 913
Basic Blue	13	50306	—	—
Basic Blue	14	50305	—	—
Basic Blue	15	44085	—	—
Basic Blue	16	12210	—	—
Basic Blue	17	52040	—	—
Basic Blue	18	42705	—	—
Basic Blue	19	—	—	—
Basic Blue	20	42585	—	—
Basic Blue	21	—	(Sevron Blue B)	—
Basic Blue	22	—	(Sevron Blue 2G)	—
Basic Blue	23	—	—	—
Basic Blue	24	52030	—	—
Basic Blue	25	52025	—	—
Basic Blue	26	44045	Victoria Blue B	CI 729
Basic Brown	1	21000	Bismarck Brown G	CI 331
Basic Brown	2	21030	Leather Brown 5RTX	Pr 552
Basic Brown	3	—	Leather Brown ET	Pr 504
Basic Brown	4	21010	Bismarck Brown R	CI 332
Basic Brown	5	—	—	—
Basic Brown	6	—	—	—
Basic Brown	7	—	—	—
Basic Brown	8	—	—	—
Basic Green	1	42040	Brilliant Green	CI 662
Basic Green	2	—	—	—
Basic Green	3	—	(Sevron Green B)	—
Basic Green	4	42000	Malachite Green	CI 657
Basic Green	5	52020	Methylene Green B	CI 924
Basic Orange	1	11320	Chrysoid ine R	CI 21
Basic Orange	2	11270	Chrysoidine G	CI 20
Basic Orange	3	—	—	—
Basic Orange	4	†46035	—	—
Basic Orange	5	†46035	Brilliant Phosphine	CI 789
Basic Orange	6	†46035	Brilliant Phosphine	CI 789
Basic Orange	7	†46035	—	—
Basic Orange	8	†46035	—	—
Basic Orange	9	†46035	—	—
Basic Orange	10	†46035	Brilliant Phosphine	CI 789
Basic Orange	11	†46035	—	—
Basic Orange	12	—	—	—
Basic Orange	13	—	—	—
Basic Orange	14	46005	Acridine Orange NO	CI 788
Basic Orange	15	46045	Phosphine	CI 793
Basic Orange	16	†46045	(Calcozine Phosphine GNC)	†CI 793
Basic Orange	16	†46045	(Calcozine Phosphine RNC)	†CI 793
Basic Orange	17	†46045	(Phosphine 2RN)	†CI 793
Basic Orange	18	46070	—	—
Basic Orange	19	46010	—	—
Basic Orange	20	—	—	—
Basic Orange	21	48035	—	—
Basic Orange	22	48040	—	—
Basic Orange	23	46075	—	—
Basic Red	1	45160	Rhodamine 6G	CI 752
Basic Red	2	50240	Safranine	CI 841
Basic Red	3	45210	—	—
Basic Red	4	45215	—	—
Basic Red	5	50040	—	—
Basic Red	6	50375	—	—
Basic Red	7	—	—	—
Basic Red	8	45150	—	—
Basic Red	9	42500	Para Magenta	CI 676
Basic Red	10	50250	—	—
Basic Red	11	45050	—	—
Basic Red	12	48070	—	—
Basic Red	13	48015	—	—
Basic Red	14	—	(Sevron Brilliant Red 4G)	—
Basic Violet	1	42535	Methyl Violet B	CI 680
Basic Violet	2	42520	New Fuchsine	CI 678
Basic Violet	3	42555	Crystal Violet	CI 681
Basic Violet	4	42600	Ethyl Violet	CI 682
Basic Violet	5	50205	Methylene Violet	CI 842
Basic Violet	6	50055	—	—
Basic Violet	7	48020	—	—
Basic Violet	8	50210	—	—
Basic Violet	9	—	—	—
Basic Violet	10	45170	Rhodamine B	CI 749
Basic Violet	11	45175	—	—
Basic Violet	12	50235	—	—
Basic Violet	13	42536	Benzyl Violet	CI 683
Basic Violet	14	42510	Fuchsine; Magenta	CI 677
Basic Yellow	1	49005	Thioflavine T	CI 815
Basic Yellow	2	41000	Auramine	CI 655
Basic Yellow	3	41005	—	—
Basic Yellow	4	—	Acridine Flavine R	Pr 8
Basic Yellow	5	—	(Phosphine GN)	—
Basic Yellow	6	46030	—	—
Basic Yellow	7	46020	—	—
Basic Yellow	8	—	—	—
Basic Yellow	9	46040	Euchrysine 2G	CI 797
Basic Yellow	10	—	(Euchrysine GGA)	—
Basic Yellow	11	48055	(Sevron Yellow R)	—
Basic Yellow	12	48065	—	—
Basic Yellow	13	—	(Sevron Yellow L)	—

† Similar to but not identical

† Similar to but not identical

DEVELOPERS

New CI Name		New CI No.	Old CI Name	Old CI No.
Developer	1	—	Developer Z	Pr 597
Developer	2	—	—	—
Developer	3	—	—	—
Developer	4	76505	—	—
Developer	5	37500	Beta Naphthol	Pr 586
Developer	6	—	—	—
Developer	7	—	—	—
Developer	8	—	Beta Oxy Naphthoic Acid	Pr 587
Developer	9	—	—	—
Developer	10	—	—	—
Developer	11	76025	—	—
Developer	12	76027	—	—
Developer	13	76060	—	—
Developer	14	76035	Metatoluylenediamine	Pr 602
Developer	15	76085	—	—
Developer	16	—	—	—

(To be concluded in Sept 9th issue)

REPRINTS AVAILABLE

Reprints of these tables will be available upon completion of their publication in the next issue on Sept 9, 1957. A schedule of prices will be published with the second and final installment.

Niagara Frontier Section———

DYEING OF ORLON ACRYLIC FIBER—— APPLICATION OF CATIONIC DYES*

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The important factors concerning the application of cationic dyes to Orlon acrylic fiber are critically reviewed. The application of these dyes to rawstock, tow, top, yarn, and woven and knitted fabrics made of Orlon and to blends of Orlon with wool and with cellulosic fibers is considered from a practical view. Attention is also directed to the introduction of a whiter, more dyeable Orlon staple which further enhances the utility of cationic dyes.

INTRODUCTION

DURING 1956 we celebrated the centennial of the synthetic dye industry which originated with Perkin's discovery of mauve, a basic dye. Until very recently, basic dyes as a class have been characterized by outstanding brilliance and equally outstanding fugitivity to light and often to washing and, therefore, have been relatively unimportant for the coloration of textile fibers. Within the past six years, acrylic fibers have become an important commercial reality. Peculiarly, basic dyes showed unexpected applicability to the early fibers of this class; hence, dye chemists directed intensive research toward improvement of their fastness properties. In the same period, the dyeing properties of Orlon acrylic fiber were improved by fiber research and practical dyeing procedures were developed.

So markedly improved are the fastness properties of Du Pont's Sevron dyes, which were tailor-made for Orlon Type 42, that they have been designated *cationic* dyes to distinguish them from the older basic dyes, although the latter include a number of dyes which yield colored cations. These new dyes provide brilliant shades which have fair to excellent lightfastness and wetfastness comparable to that of vat dyes on cotton. Three old basic dyes are supplementary for the economical production of heavy shades of good lightfastness.

Tremendous success has been realized in the commercial application of the cationic dyes to Orlon Type 42 acrylic fiber. Yet, fiber research has been continued and presently, as a new merge of Orlon Types 42 and 39, a staple of improved durable whiteness and cationic dyeability is being introduced commercially and will be referred to hereinafter as "more dyeable Orlon". (Orlon Type 39, a fiber of mixed deniers and variable staple length designed for processing on the woolen system, is equivalent in dyeability to Orlon Type 42.) Because the cationic dyes offer greatest versatility in the dyeing of Orlon, the factors involved in their application will be given paramount consideration in this paper.

* Presented by J P Neary before the Niagara Frontier Section at Buffalo, NY on January 11, 1957.

Original paper was presented at the Fifth Canadian Textile Seminar held at Queen's University, Kingston, Ont, June 6-7, 1956 and published in the *Fifth Canadian Textile Seminar Book of Papers*.

A list of trademarks appears at the end of this paper.

DYEBATH CONDITIONS

PREPARATION OF MATERIALS CONTAINING ORLON———The use of a nonionic detergent is recommended in preparing material containing Orlon to which cationic dyes are to be applied. If an anionic detergent should be used and is incompletely removed, deposition of dye cation-detergent anion salts could occur and contribute to weakness, unevenness and fastness deficiencies. The use of ammonium hydroxide is generally not recommended since ammonium ions are absorbed readily by the fiber (*1*). Subsequent hot processing can liberate absorbed ammonia and effect shade changes in certain dyes.

BATH COMPOSITION ——— The cationic dyebath is usually set at 120° to 140° F with

0.3–0.5%	sodium acetate or
5.0–10.0%	anhydrous sodium sulfate
0.0–0.6%	retarding agent of the Du Pont Retarder LAN type or
0.0–3.5%	retarding agent of the Du Pont Retarder DO type
0.5%	nonionic surfactant of the Alkanol HC or Capracyl Leveling Salt type
—%	acetic acid

Sodium acetate eliminates the indicator effect exhibited by some cationic dyes during dyeing and more frequently manifested by a color change on pressing (*2*). Sodium sulfate likewise accomplishes this end but also enhances levelness. Certain retarding agents, such as Du Pont Retarder LAN, promote level dye absorption by Orlon Types 42 and 39, particularly in light and medium shades. Others, such as Du Pont Retarder DO, fulfill a similar function with the more dyeable staple. The nonionic surfactant serves as a wetting agent and diminishes cationic dye staining of other fibers in blends with Orlon.

pH LIMITATIONS———The cationic dyes recommended by the Du Pont Company are listed in Table I (*3*). All are applicable in the pH range 4.5-5.5 (Group II) and, hence, all can be used in combination with one another in this range. The dyes listed in Group I of Table I are also applicable at pH's 4.5-8.0 and, therefore, can be used in a neutral or slightly alkaline dyebath, as would be the case in dyeing blends of Orlon acrylic fiber and cotton or rayon with direct dyes or of Orlon and wool with

TABLE I
Optimum dyebath pH conditions for Du Pont's cationic dyes for Orlon acrylic fiber

Cationic dye	Dyebath pH range for satisfactory stability: Group I 4.5–8.0	Group II 4.5–5.5
Sevron Yellow L		x
" Yellow R (*CI* 48055)		x
" Orange G	x	x
" Orange L	x	x
" Brill Red 4G	x	x
" Brill Red B	x	x
" Brill Red 3B	x	x
" Blue B	x	x
" Blue 2G	x	x
" Blue 5G	x*	x
" Green B		x
Du Pont Fuchsine Conc (*CI* 42510)		x
" " Victoria Green Small Crystals (*CI* 42000)		x
" " Brill Green Crystals (*CI* 42040)		x

* Practical upper limit for dye is pH 7.0

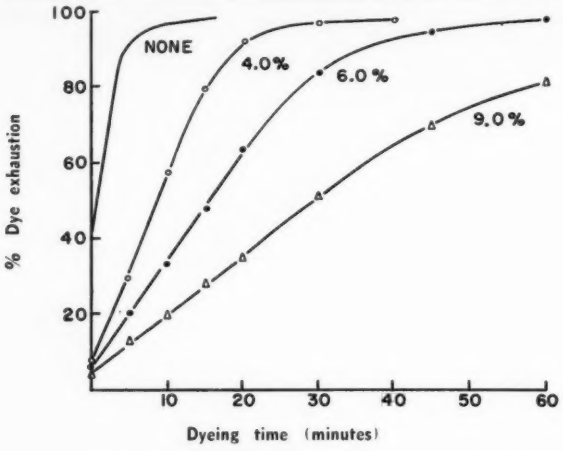

Figure 1
Effect of Du Pont Retarder LAN on the dyeing rate of 0.25% Sevron Brill Red 4G at 212°F

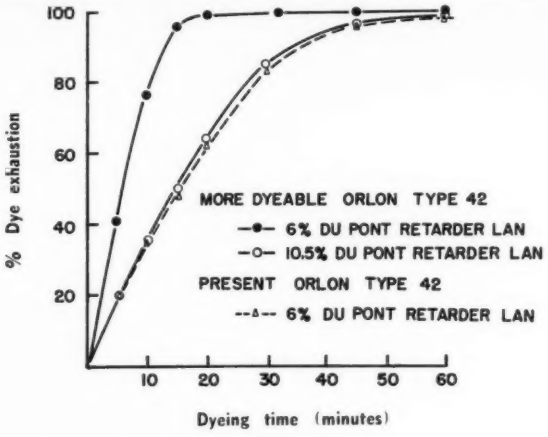

Figure 2
Dyeing rate of 0.25% Sevron Brill Red 4G at 212°F

neutral-dyeing acid, milling, or neutral premetalized dyes.

All of the cationic dyes in Table I, except Orange L and Red L, can be applied at pH's as low as 4. In light shades particularly, if too much acid is used in the dyebath, Orange L dyes appreciably redder in shade and Red L dyes noticeably bluer and brighter. In heavy shades, however, these two dyes exhibit negligible shade sensitivity to pH.

DYE APPLICATION FACTORS

FUNCTION OF RETARDING AGENTS——Successful dyeing of Orlon Type 42 acrylic fiber requires a temperature of 208°F or higher. At these temperatures, however, cationic dyes exhibit so great an affinity for Orlon that retarding agents must be employed to insure their level application in light and medium shades. By competing with dyes for the fiber, the retarding agent slows down the rate of dye absorption.

The influence of one such retarding agent, a colorless cationic product, on the rate of exhaustion of a 0.25% cationic dyestuff at 212°F is demonstrated graphically in Figure 1. In the absence of retarder, more than 40 percent of the dye was exhausted in the time required to attain the boil and essentially complete exhaustion occurred within ten minutes at the boil. It is readily seen from this figure, as well as from Table IV, that the rate of exhaustion of dye can be controlled by the addition of a retarder. Level application of cationic dyes in light shades, particularly on piece goods, would obviously be most difficult to achieve without the aid of a retarding agent. Yet, the dyeing cycle is not prolonged, for with such an agent little dyeing occurs until near-boil temperatures are reached and, therefore, the boil can be attained more rapidly.

TABLE II
Retarder requirements to control dye levelness on Orlon Type 42

% Sevron cationic dye	% Du Pont Retarder LAN 212° F	206°-210° F
<0.1	8.0 to 6.0	6.0 to 5.0
0.1 to 1.0	6.0 to 4.0	5.0 to 3.0
1.0 to 3.0	4.0 to 2.0	3.0 to 1.0
> 3.0	2.0 to none	1.0 to none

Excessive amounts of retarder cause an unnecessarily slow rate of dyeing and prevent satisfactory exhaustion of the dyebath, as is illustrated by the rate curve obtained with 9.0% retarder in Figure 1. Practical requirements of this retarding agent to control levelness of Sevron dyes in different shade depths on piece goods of Orlon Type 42 are given in Table II. To determine the amount of retarder required for dyeing combinations containing the old basic dyes, the concentration of the latter is multiplied by four and added to the concentration of the Sevron dyes.

Because of its increased dye capacity, the whiter, more dyeable Orlon staple requires approximately 75 percent greater amounts of above type retarder to provide cationic dyeing rates similar to those observed with the present Type 42. Shown in Figure 2 are exhaustion curves which illustrate this relationship. Du Pont has introduced another type of retarding agent for use with the more dyeable Orlon for which it was especially designed. The curves in Figure 3 show a comparison of Du Pont retarders used to exert control on the rate of exhaustion of a 0.25% cationic dyestuff by the more dyeable Orlon acrylic fiber at 212°F. No increase in retarder costs in dyeing the more dyeable fiber is expected. The recommended concentrations of the retarder shown in Table III permit essentially complete dyebath exhaustion with good levelness in 40 to 60 minutes at 212°F. In dyeing medium to heavy shades on the more dyeable Orlon, the use of small amounts of retarder is advocated to control effectively the initial strike of cationic dyes brought about by the greatly increased dyeability of the fiber. Such practice should not significantly affect the capacity of the newer fiber to absorb the full amount of dye applied.

TABLE III
Retarder requirements to control dye levelness on more dyeable Orlon at 212° F

% Sevron cationic dye	% Du Pont Retarder DO
<0.1	5.0 to 4.5
0.1 to 1.0	4.5 to 2.5
1.0 to 3.0	2.5 to 1.25
3.0 to 5.0	1.25 to 0.5
> 5.0	0.5 to none

LEVELING ASSISTANT —— Control of dye levelness is further enhanced by the use of sodium sulfate (calcined Glauber's salt) in conjunction with the cationic retarding agent (4). This salt promotes transfer of the cationic dyes and also exerts a slight retarding action on the dyeing rate. Other salts are also effective in varying degrees, depending on available ion constituents. Although a full explanation for the effectiveness of such salts is not available, it is probable that the action involves both the attraction of the dye cation for the salt anion in the bath and the competition which the metal cation offers

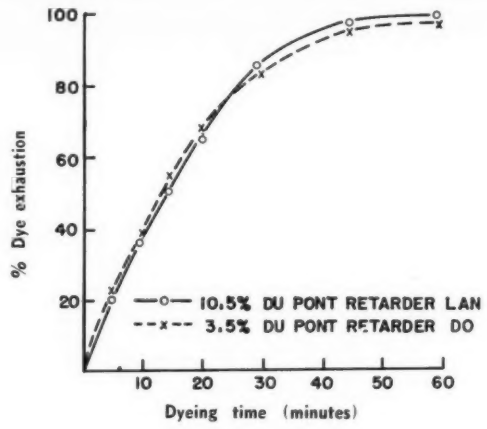

Figure 3
Comparison of Du Pont retarders on more dyeable Orlon Type 42. Dyeing rate of 0.25% Sevron Brill Red 4G at 212°F

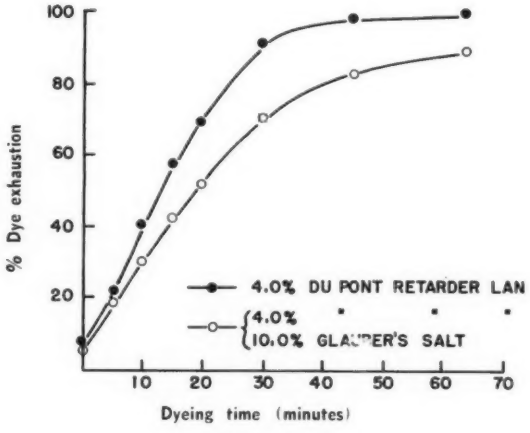

Figure 4
Effect of Glauber's salt on dyeing rate of 1.0% Sevron Blue B at 212°F

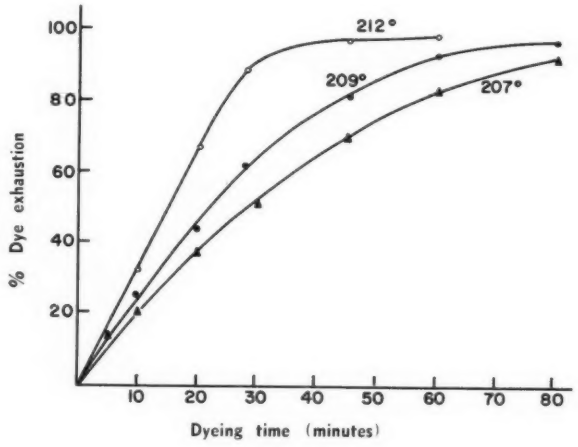

Figure 5
Effect of temperature on the dyeing rate of 0.25% Sevron Brill Red 4G using 6.0% Du Pont Retarder LAN at 212, 209 and 207°F

the dye for the fiber. For dyeing all light-to-medium shades on 100% Orlon, approximately 10% sodium sulfate (anhydrous) on weight of fiber is recommended. When this amount of sodium sulfate is used, the concentration of retarding agent recommended for level dyeing can be reduced by 20 to 30 percent.

As shown in Figure 4, the presence of sodium sulfate in the bath along with a retarder slows down the rate of exhaustion of dyes. Also, somewhat more dye is left in the bath, a condition generally attendant with dye transfer.

For dyeing light shades, the use of sodium sulfate alone is not advisable, since the degree of retardation obtained is insufficient to insure level application of the dyes. To control levelness with some of the more troublesome deep shades, such as deep reds, however, 5 to 10% sodium sulfate is frequently used to good advantage. In such shades on the present Type 42, a cationic retarding agent is undesirable, since the full dye capacity of the fiber might be required to obtain the desired shade.

DYEING TEMPERATURE——Temperature has been indicated as an important factor in the successful dyeing of Orlon. The effect of temperature on the rate of exhaustion of cationic dyes by Orlon Type 42 is graphically demonstrated in Figure 5. In this typical case, it can be seen that a drop of 5°F in dyeing temperature approximately *doubled* the time required to obtain any given degree of dyebath exhaustion. Summarized in Table IV are comparative degrees of exhaustion attained with a number of Sevron cationic dyes applied at 212° and 207°F alone and in the presence of a retarder. It is interesting to note here that, in absence of retarder, the dyeing rates at 207°F are very similar to those observed at 212°F. This factor emphasizes the need for retarding agent for control of dye levelness even at the lower temperature. When full-boil conditions are not attainable in existing dyeing equipment, somewhat lesser amounts of retarder, as shown in Table II, can be employed to afford practical levelness control and reasonable dyeing times.

In dyeing heavy shades on the present Orlon Type 42, which may require two to three hours even at 212° F, it is particularly desirable to maintain a good boil to avoid prolonged dyeing times.

When cationic dyes are applied to Orlon in blends with wool and with cellulosic fibers, the initial stain of

TABLE IV

Effect temperature and retarding agent on the exhaustion performance of Sevron cationic dyes on Orlon Type 42 acrylic fiber

			Percent Exhaustion					
	Time (minutes)		5		15		60	
	Temperature, °F		212	207	212	207	212	207
% Dye	Sevron cationic dye	% Du Pont Retarder LAN						
0.25	Yellow L		98	97	99	99		
		6.0	17	14	42	30	92	83
0.25	Brilliant Red B		97	97	99	99		
		6.0	27	18	56	34	98	88
1.0	Blue B		69	43	97	89		98
		4.0	23	10	57	25	99	87
0.25	Blue 5G		95	97	99	99		
		6.0	17	17	34	26	89	81
0.25	Green B		87	60	98	92		98
		4.0	8	9	30	17	97	74

the cationic dyes on the other blend component can be greatly reduced by dyeing at a full boil. At lower dyeing temperatures, the wool or cellulosic fibers frequently remain stained.

With the whiter, more dyeable Orlon staple, dyeing temperature is less critical, since good dye uptake is exhibited even at 205°F. Full, deep, lightfast shades of brown, navy and black are, therefore, much more readily attainable, normally in 1.5 hours or less. Full-boil conditions are still recommended for the dyeing of Orlon in blends, however, to insure maximum dye transfer from and minimum cationic dye stain on the other blend components.

OTHER FACTORS —— Variations in dyebath volume ratio from 20:1 to 80:1 have been found to exert no significant effect upon the rate of exhaustion of cationic dyes. Excessive acidity, however, has been observed to cause slower dyeing rates and incomplete dyebath exhaustion in addition to alteration of the shade of certain cationic dyes.

LEVELING AND STRIPPING

Occasionally it is necessary to salvage poorly dyed goods which may have come up off-shade, streaky or too strong because of failure of the human or mechanical elements involved. As was pointed out earlier, unlevelness problems can be minimized by the use of proper amounts of retarding agent along with from 5 to 10% anhydrous sodium sulfate.

Partial stripping and leveling of cationic dyes is promoted by sodium sulfate when used in relatively high concentrations (4). Accordingly, slight defects of streakiness or shading, and shades which have come up too strong on Orlon Type 42 acrylic fiber can often be corrected by reworking the material for one to two hours at the boil in a bath containing (on total fiber weight)

10–15% sodium sulfate, anhydrous.
1% leveling salt of the Capracyl type or surface-active agent of the Alkanol HC type,
2% retarder (of the Du Pont Retarder LAN type) and
—% acetic acid (to about pH 5).

When the more dyeable Orlon fiber is involved, the same formulation can be used, except that ca 1.2% retarder of the Du Pont Retarder DO type is substituted for the aforementioned retarder. The above procedure also serves a similar function in processing blends of Orlon with other fibers.

Selected anionic[4] surfactants have also been found effective as partial stripping agents for cationic dyes on Orlon. The effectiveness of anionic surfactants may be attributed to their interaction with dye cations to form insoluble salts which remain well dispersed because of the high concentration of surfactant in the bath. Accordingly, such agents provide little or no transfer or leveling action. Sodium oleate is a very effective stripping agent. As much as 75 percent of the original dye on the fiber can be removed by reworking the dyed fabric for about two hours at 212° F in a bath containing 10% sodium oleate (on weight of fiber). Suitable water-softening agents may be required in hard-water areas. The soap stripping procedure has proved effective on goods of 100% Orlon acrylic fiber and blends of Orlon with cellulosic fibers. Because of its operable pH range of 7 to 10, this procedure cannot be recommended for use with blends of Orlon and wool since such alkaline conditions are deleterious to wool.

Certain anionic surfactants, such as Compound No. 8-S and Duponol D Paste, although less effective, offer the advantage of utility under acidic conditions. The stripping performance of these can be enhanced by the incorporation of Dowicide A (sodium salt of ortho-phenylphenol) in the bath, which is then acidified to pH 5. It should be noted, however, that residual ortho-phenylphenol in the fiber causes more rapid uptake of cationic dyes in redyeing and also contributes a slightly adverse effect to the lightfastness of some dyeings.

To provide adequate redyeability of partially stripped goods, it is essential that a sufficient amount of the colorless cationic retarding agent also be stripped should it have been used in the initial dyeing. The oleate soap treatment is particularly effective in this application and greatly facilitates over-dyeing to full, deep shades. The other anionic surfactants discussed are slightly less effective.

Complete stripping of cationic dyes from Orlon requires the use of strong oxidizing agents. The stripped fiber can be redyed satisfactorily, but repeated strippings may reduce the affinity of the Orlon for cationic dyes. It has been found, however, that a sodium oleate scour improves the redyeability of goods which have been subjected to the more vigorous dye-stripping procedures. The soap scour greatly facilitates redyeing to deep shades by aiding in the removal from the fiber of colorless cationic materials remaining from decomposed dye or cationic retarding agent.

Below are two commonly used stripping procedures. However, these cannot be used on blends of Orlon with wool or other animal fibers. (Percentages are based on total fiber weight.)

Textone Strip*
5.0% Textone (sodium chlorite, 75-77%) and
1.5% nitric acid, conc.
Apply for about 45 minutes at the boil.
Rinse goods well.

Sodium Hypochlorite Strip
10–20% sodium hypochlorite (15% active chlorine),
—% acetic acid, to pH 5 to 6, and
5–10% sodium nitrate.
Apply at the boil until desired stripping is obtained, usually no longer than 20-30 minutes.
Rinse goods well.

* Textone liberates chlorine dioxide during stripping and must be used with adequate ventilation.

With either stripping procedure, an afterscour with a nonionic detergent and tetrasodium pyrophosphate or a treatment with an antichlor, eg, sodium bisulfite, is suggested to remove all traces of residual chlorine.

In stripping sweaters which have been sewn with nylon thread, prolonged boiling in the hypochlorite solution should be avoided since such treatment will seriously degrade nylon. This method usually strips light and medium shades in about five minutes, but heavy shades may require adds of stripping agent. It is interest-

ing to note that the hypochlorite method will effectively remove Sevron Blue 5G, which is not significantly affected by the method using Textone.

The corrosive effects of acidified hypochlorite solutions on stainless steel are apparently inhibited by the addition of sodium nitrate to the bath. The effectiveness of the stripping agent is not noticeably altered by the presence of the sodium nitrate.

The fastness characteristics of stripped and redyed Orlon are about equivalent to those of dyed Orlon which has not been stripped.

PRACTICAL DYEING CONSIDERATIONS (ORLON STAPLE)

RAWSTOCK DYEING——Orlon Type 42 and Type 39 rawstock are dyed in conventional rawstock dyeing equipment at temperatures as close to the boil as possible or, preferably, in pressurized equipment at dyeing temperatures of 212° to 230°F to reduce dyeing time and obtain greater utilization of dyes, particularly for heavy shades. A very satisfactory dyeing procedure has been to load the rawstock into the kier half filled with water at 200° to 210°F. The cover is then placed in position, the kier filled with water to obtain circulation and the temperature set at 180°F. Chemicals and dyes are then added and heat applied to obtain approximately 1.5°F per minute rise to the dyeing temperature. Dyeing is then carried out for one half to three hours, depending upon the dyeing temperature and depth of shade.

TOW DYEING——With the development of interest in the use of high-bulk yarns in multicolor Jacquard-knit fabrics and fancy woven fabrics, attention was directed to the dyeing of tow. This is accomplished by batch operation (5) in

1) rawstock machines,
2) package machines,
3) top dyeing equipment, and
4) beam dyeing equipment.

The last two, however, are still in the development stage.

In rawstock and package machines, the tow is plaited wet into a perforated stainless-steel basket, the basket placed in the kier, and the tow dyed. When tow is to be dyed in top dyeing equipment, eg, on the Fredericks System, the tow bundle is split into its individual ropes, which are wound into balls similar to worsted top, placed on the spindle and dyed. For beam dyeing, the tow is wound wet on a stainless-steel perforated beam and dyed in the kier, extracted and dried on a port dryer.

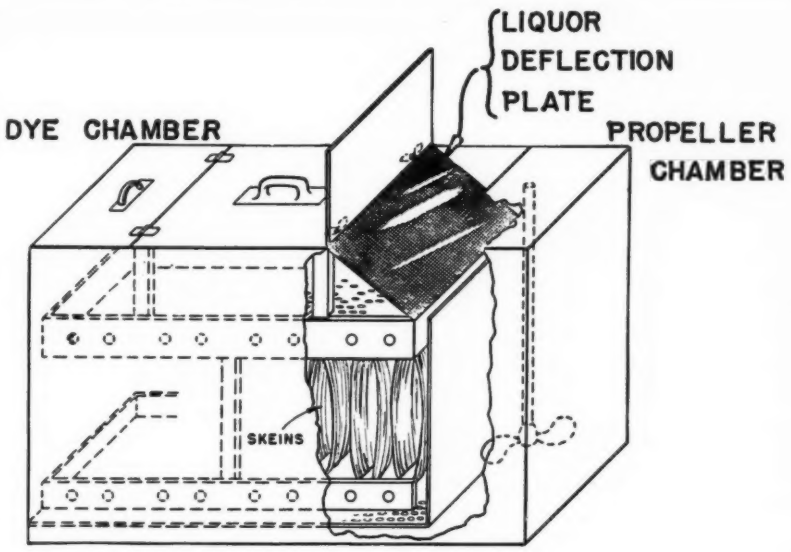

Figure 6
Hussong skein-dyeing machine

The dyes used must be fast to dry heat, high-temperature steam, and crocking. The cationic dyes and selected disperse dyes meet these fastness requirements. The dyed tow must be free of twists, tangles, and slack so that it can be processed at high efficiency through the Turbo Stapler or Pacific Converter. Because it meets these important requirements, beam-dyed tow has been successfully processed directly from the beam to the Turbo Stapler. This method minimizes handling of the fiber and damage to filaments.

The feasibility of dyeing tow continuously has been demonstrated in the laboratory. The procedure is based on the work of Ray (6) and consists in the steps of impregnating the tow with a liquor at 120° to 140°F containing the cationic dyes and ca 50 g/l ethylene carbonate* to a pick-up of ca 100 percent, steaming, washing, scouring, washing and drying. For full navies or blacks, as much as 100 g/l ethylenecarbonate may be required to effect efficient utilization of dye. In light shades, however, low concentrations will suffice and in some cases this assistant may be omitted from the pad liquor. Steaming for five minutes at 212° to 220°F appears practical but superheating the steam to 240° to 260°F at atmospheric pressure will produce somewhat more effective utilization of dye in medium and heavy shades. An antistatic agent is incorporated in the final wash liquor.

The continuous process appears particularly attractive for dyeing the more dyeable Orlon tow. It is pointed out that several strands of tow can be processed parallel to each other through the same equipment in this dyeing operation. It is conceivable that the tow could be processed continuously from the dryer through the Turbo Stapler or Pacific Converter.

TOP DYEING——Orlon top is being dyed in limited amounts in the Fredericks machine mainly at atmospheric pressures with reduced liquor-flow pressures to avoid distortion of tops.

YARN DYEING —— Package dyeing of Orlon yarn is carried out on Davidson or Franklin springs or on 5/8" or preferably 1 5/8" tubes. Medium-hard packages are desirable since the yarn tends to relax and the packages soften in the heated dyebath. After dyeing, slow cooling is necessary to maintain maximum yarn loftiness.

Spun yarns of Orlon can be skein-dyed on the Hussong or the Obermaier-Steinen machines. Cascade machines are not suggested since they have a tendency to stretch the yarn and make it lean. Hussong machines should be fitted with bot-

* Preliminary toxicological data indicate use of this product to be nonhazardous; however, it is suggested that those contemplating its use verify this by communicating with the manufacturers and vendors—Jefferson Chemical Company, Inc, 260 Madison Ave, New York 16, N Y; Union Carbide Chemicals Co, 30 East 42nd Street, New York 17, New York.

tom as well as top rods to prevent floating and tangling of the skeins. These machines should also have a hinged liquor deflection plate (as illustrated in Figure 6), which reduces surface turbulence and greatly improves the top to bottom flow characteristics (*7*).

After dyeing, the skeins should be cooled slowly to obtain the loftiest yarn possible.

Yarns of high-bulk Orlon should be preshrunk before dyeing. To do this the skeins are loaded on the carriage while it is out of the bath. Allowance for 18 to 20 percent shrinkage of the yarn should be made in setting the bars. Before the rack of skeins is entered, the bath is set at about 205°F with 1.0% surface-active agent of the Alkanol HC type and circulation stopped. The carriage containing the skeins is then submerged in the hot still bath and held five minutes to permit full relaxation of the yarns. Circulation is resumed and scouring continued for fifteen minutes at the boil. After the bath is cooled slowly and dropped it is refilled and the Orlon is dyed in the usual way. A low or medium flow rate is helpful in maintaining loft and bulk of the yarn.

Various softeners and finishes are substantive to Orlon (ie, they exhaust from a bath) and will effectively soften the yarn. The percentage of softener applied should be carefully regulated. More than 1.0 to 2.0 percent may decrease the strength of the yarn by causing fiber slippage (*8*).

FABRIC DYEING——Woven or knit fabrics of 100% Orlon Type 42 or of blends of Orlon with wool, rayon, or cotton are dyed in closed becks at temperatures preferably in the range of 208° to 212°F. An overhead perforated steam line will insure maintenance of this dyeing temperature. However, in this equipment special care must be taken, particularly in dyeing fine gauge jersey, to avoid vigorous boiling which can cause tangling of individual fabric ropes.

SWEATER DYEING —— Strips of sweater bodies or full-fashioned sweaters of Orlon acrylic fiber, usually high-bulk Orlon, are dyed in mesh bags, preferably made of Orlon Type 81. These bags have proved most satisfactory because they permit free circulation of the dye liquor through the load and free movement of the sweaters within the bag (*9*).

Paddle machines of the type used for dyeing half hose are also used for sweater dyeing. For machines of 100 pounds or more capacity, a bag of approximately 30″ x 54″ is loaded with 17 to 21 pounds of goods. In smaller machines, bags 24″ x 30″ containing 12 pounds of goods give better results. The sweater strips should be loaded in the bags at open width to prevent wrinkling. Care should be taken to avoid overloading since it prevents the relaxation and bulking of the Orlon. Underloading the bags causes the strips or sweaters to stretch or tangle and should be avoided. Since the weight varies with the construction and size of the sweaters, some experimentation may be required to establish optimum conditions.

Following dyeing, quick cooling should be avoided in order to prevent wrinkling; at least 20 minutes should be allowed to reach 175°F. The material may then be scoured for 10 to 15 minutes at 160°F with 1.0% surface-active agent of the Alkanol HC type) and 0.5% acetic acid, glacial. If good exhaustion is obtained, little or no scouring is necessary.

Typical shade formulations are given in Appendix A (*10*).

TABLE V
Procedures for simultaneously dyeing Orlon and wool

Method A using cationic and neutral-dyeing premetalized dyes* (light to medium shades)

Prescour to neutralize wool—15 minutes at 160°F using
1.0% Capracyl Leveling Salt, and
1.0% trisodium phosphate.
Set fresh bath at 140°F with
1.0% Capracyl Leveling Salt,
1.0% monosodium phosphate,
—% retarding agent of the Du Pont Retarder LAN type, and
—% cationic dyes.
Raise temperature to boil and add
—% neutral-dyeing premetalized dyes*
Dye at boil one to two hours. Toward end of dyeing cycle, add acetic acid to pH 5 to reduce cationic dye stain on wool and to exhaust neutral-dyeing premetalized dyes. Color adds for shade correction are made after cooling to 180°F.

Method B using cationic and selected acid dyes (medium and heavy shades)**

Prescour as in Method A.
Set fresh bath at 140°F with
0.5 to 1.0% Capracyl Leveling Salt, and
—% acid dyes**.
Adjust pH to recommended level.
Raise temperature to 180°F. Add
% dye retarding agent (if necessary) and
—% cationic dyes.
Dye at boil.
Exhaust acid dyes with acetic acid.

*Selected neutral-dyeing acid dyes may also be applied.
**Milling, neutral-dyeing acid and selected chrome dyes are among the types applicable.

BLENDS

Orlon is being combined with many other fibers to produce fabrics having outstanding functional and aesthetic properties. Most important are blends with wool and with cellulosic fibers to which the discussion in this paper will be limted.

Numerous styling choices are available to the designer of blended fabrics: either fiber can be left white as the other is dyed; both fibers can be dyed to the same shade; or both fibers can be dyed to different or contrasting shades.

BLENDS OF ORLON AND WOOL ——The most popular blends encountered in this category include woven goods of a nominal 50:50 composition and fine-gauge jersey fabric in an 80:20 blend of Orlon with wool. Significant poundages of Orlon, however, are used in many all-wool fabrics as resist effects which can be left white or can be cross-dyed.

The most satisfactory method for piece-dyeing union shades employs cationic dyes for the Orlon and acid dyes for the wool. Although a wide selection of colors for wool is available, attention has been focused on wool dyes of superior fastness properties, such as neutral-dyeing acid, milling and chrome dyes and the neutral-dyeing premetalized dyes.

Although some dyers prefer to dye the two fiber components from separate baths, it is feasible to dye the Orlon and wool by the single-bath procedure (*4, 11*), Methods A and B, which are summarized in Table V. Method A is particularly suited to the production of light-to-medium shades having superior fastness properties and employs neutral-dyeing premetalized and selected neutral-dyeing acid dyes for the wool. After the fabric has been neutralized and scoured, the bath is set at neutral pH with a leveling salt, monosodium phosphate and a retarding agent. The cationic dyes are then introduced and the temperature is raised. At any convenient temperature, from 190° to 212°F the wool dyes are added in accordance with the recommended procedure for application of neutral dyeing premetalized dyes to wool in the presence of leveling salt (*12*). Toward the end of the dyeing cycle acetic acid is added to pH 5 to reduce cationic dye stain on the wool and to exhaust the wool dyes.

In Method B, medium shades can be obtained with available hydrolytically stable cationic dyes; milling or neutral-dyeing acid dyes or selected chrome colors are applied to the wool. Heavy shades are readily produced when mildly acid conditions of pH 6 or lower can be used for application of the wool dyes selected. All cationic dyes are useful under such

conditions. In this procedure, the bath is set with the usual assistants and wool dyes at the required neutral or slightly acid pH level. The temperature is raised to 180°F, whereupon retarding agent, if required, and the appropriate cationic dyes are added. Both fibers are dyed at the boil. Acetic acid can be added to exhaust the wool dyes and to promote transfer of cationic dye stain from wool to Orlon acrylic fiber.

When shade formulations require the use of dyes listed in Table I which are hydrolytically unstable at pH's above 5.5, modification of Methods A and B becomes necessary. Here, addition of the cationic dyes must be delayed until after the neutral-dyeing colors are partially exhausted whereupon the pH of the dyebath can be gradually lowered to about 5 by addition of acetic acid. The cationic dyes, along with retarder (if required), are added at 180°F and then exhausted at the boil. This single-bath, two-step procedure can be employed with all of the cationic dyes without restriction.

In cross-dyeing contrasting shades on the wool and the Orlon, little or no staining of the wool by the cationic dyes can be tolerated. It is advisable, therefore, to adhere strictly to the recommended use of Capracyl Leveling Salt, high dyebath temperatures and proper dyebath pH to minimize wool staining.

With blends containing small percentages of Orlon, better shade control is obtained by a two-bath process. Both fibers are dyed conventionally, the Orlon first, and then the wool in a fresh bath. If sulfuric acid is used in cross-dyeing the wool, the Orlon must be previously dyed with relatively acid-insensitive cationic dyes which are listed in Table VI.

When the wool is to be left undyed, the Orlon component can be dyed to a full range of shades by conventional techniques. If wool staining is evident, as with the older basic dyes, the light stains can be cleared by a scour with leveling salt of the Capracyl type and acetic acid applied for 30 minutes at 200 F. Heavier stains are removed by stripping with sodium formaldehyde sulfoxylate and acetic acid for 20 minutes at 180° to 190° F. This strip does not noticeably affect the shade on the Orlon.

Blends in which the wool is to be dyed and the Orlon left white offer no problem. The wool component can be dyed in a complete range of shades with little or no staining on Orlon (*13*).

Typical formulations for union- and cross-dyed shades applied to a blend of Orlon and wool by the procedures discussed are presented in Appendix B.

TABLE VI
Relatively acid-insensitive Sevron cationic dyes

Yellow L
Yellow R
Orange G
Brilliant Red 4G
Brilliant Red B
Blue B
Blue 2G
Blue 5G
Green B

Occasionally, it is desirable to carbonize blends of Orlon and wool *after* dyeing. Orlon is normally unaffected by conventional carbonizing techniques. No shade change on carbonizing with sulfuric acid when followed by *prompt* neutralization is shown by the dyes in Table VI except Green B. Other cationic dyes may exhibit a considerable shade change in carbonizing, but conventional neutralization with soda ash will at least partially restore their original shade. Additional neutralization for about 30 minutes at 100° to 120° F with 5 to 10% ammonium hydroxide (28%) will satisfactorily restore the original hue, but the shade may have become appreciably weaker.

BLENDS OF ORLON AND CELLULOSIC FIBERS——A variety of fabrics made of blends of Orlon with rayon, cotton, or linen is available. Currently, those containing rayon predominate. Major production items are fabrics of about 90% Orlon and 10% rayon and also 50% Orlon and 50% rayon.

Cationic dyes and the old basic dyes or disperse dyes are applied to the Orlon and direct dyes to the rayon. Conventional resin aftertreatments to impart good washfastness to the direct dyes can be employed without significant effect on the shade of the cationic dyes. For maximum washability, however, vat dyes must be used on the cellulosic component.

In union- and cross-dyeing, the depth of shade desired dictates the dyeing procedure to be selected. Light and pastel shades are applied in a straightforward, one-bath operation. In this method both selected disperse dyes and direct dyes together with Glauber's salt are added to the bath, the temperature raised to the boil and dyeing continued until the disperse dyes are exhausted on the Orlon. The bath is cooled to 160° to 180° F to effect optimum exhaustion of the direct dyes.

A one-bath, two-step process is recommended for dyeing medium and heavy shades. The goods are scoured and rinsed clear. The dyebath is set with sodium acetate and a surface-active agent of the Alkanol HC type or a leveling salt of the Capracyl type and the pH adjusted to 4 to 5. Cationic dyes are added at any convenient temperature up to about 180° F and the Orlon is dyed to shade at the boil. The bath is then cooled to 160° F by dropping about half the liquor and refilling slowly with cold water. The pH of the bath is adjusted to 8 to 9 by addition of 2.0 to 3.0% trisodium phosphate, the direct dyes and salt added and the cellulosic portion of the blend dyed at 160° to 180° F. The goods are finished with a cold salt water rinse.

When a retarding agent of the Du Pont Retarder LAN type is employed for level application of the cationic dyes, as in light shades, two-bath procedures are recommended. Likewise, two baths should be used whenever considerable staining of the cationic dyes is noted on the cellulosic fiber. The Orlon is dyed with cationic dyes in the first bath and the cellulosic fiber dyed with direct dyes in a fresh bath. With shades that produce heavy staining of the cellulosic fiber, a scour or a strip is used before the cellulosic fiber is dyed. The scour with sodium formaldehyde sulfoxylate and acetic acid is useful in this application. It is well to remember that temperatures as close to 212°F as possible are recommended for the successful dyeing of Orlon. As with wool dyed in the presence of Orlon, cellulosic fibers also show undesirable staining when lower dyeing temperatures are employed.

Direct-dye fixing agents and crease-resistant resin finishes can be applied to the goods by conventional methods with negligible effect on the shade of the cationic dyes.

Where maximum washability is necessary, the Orlon can be dyed first with cationic dyes and the rayon dyed subsequently with vat dyes applied by conventional means. Little or no staining of the Orlon is evident with many vat dyes. Stains of cationic dyes on the cellulosic fiber are removed in the vat process. In certain constructions it may be desirable to reverse the procedure, that is, dye the cellulosic fiber by a pad-jig or a pad-steam process, and then fill in the Orlon with cationic or disperse dyes.

Disperse dyes are generally used to dye pastel and light shades on the

Orlon while reserving the cellulose portion of the blend. Negligible staining of the cellulosic fiber is encountered.

Cationic dyes are used on the Orlon acrylic fiber to obtain medium and deep shades. Staining of the cellulosic fiber is variable, depending upon the particular cationic dyes used and the degree of exhaustion of the dyebath obtained. Objectionable stains can be removed from the cellulosic fiber by either a scour with a surface-active agent of the Alkanol HC type or a leveling salt of the Capracyl type and acetic acid, a stripping bath with sodium formaldehyde sulfoxylate and acetic acid as previously discussed in the dyeing of blends of Orlon and wool, or treatment for 20 minutes at 110° to 120°F with 5.0% Clorox and 2.5% acetic acid (56%).

The cellulosic component can be conventionally dyed with vat or direct dyes, usually with an excellent reserve of the Orlon.

The foregoing methods are useful for dyeing blends of Orlon with cotton, rayon, or linen, but the dyes selected for the cellulosic fiber should provide adequate fastness for the intended end use. Typical formulations for union-dyed and cross-dyed shades appear in Appendix C.

FASTNESS PROPERTIES

To have attained the wide usage on Orlon manifested in the foregoing sections of this paper, it is evident that the cationic dyes must possess lightfastness far superior to that of the earlier basic dyes. As a matter fact, some of the Sevron cationic dyes exhibit outstanding lightfastness as is attested by the ratings in Table VII.

The wetfastness of the cationic dyes on Orlon is comparable to that of vat dyes on cotton.

Thus, with the Sevron line, many commercial shades for varied end uses can be made. The old basic dyes are supplementary. Du Pont Fuchsine Conc, Du Pont Brilliant Green Crystals, and Du Pont Victoria Green Small Crystals as the bases of navies and blacks are economical as well as fast to light.

ACKNOWLEDGMENT

The material presented in this paper has been developed as the result of the cooperative effort of many individuals in the Organic Chemicals and Textile Fibers Departments of the Du Pont Company. The participation of L Bidgood, R P Carney, R A Clarke and M C Harmon in the present instance is particularly acknowledged.

TABLE VII

Lightfastness of Sevron cationic dyes on Orlon Type 42 acrylic fiber

2.0% Dyeings	Fade-Ometer Hours
Yellow L	160
Yellow R	160-320
Orange G	40-80
Orange L	160-320
Brilliant Red 4G	20-40
Brilliant Red B	40-80
Brilliant Red 3B	10-20
Red L	160-320
Blue B	80-160
Blue 2G	80
Blue 5G	10-20
Green B	20-40

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APPENDIX A

Typical shade formulations for 100% Orlon Type 42 Acrylic Fiber

Gold

2.0 %	Sevron Yellow L
0.01 %	Sevron Brilliant Red 4G
3.0 %	Du Pont Retarder LAN

Tan

0.3 %	Sevron Orange L
0.02 %	Sevron Red L
0.4 %	Sevron Blue 2G
10.0 %	sodium sulfate, anhydrous
4.0 %	Du Pont Retarder LAN

Medium Brown

0.8 %	Sevron Orange L
0.26 %	Sevron Red L
1.6 %	Sevron Blue 2G
10.0 %	sodium sulfate, anhydrous

Jockey Red (1)

0.09 %	Sevron Yellow R
1.80 %	Sevron Orange G
0.135%	Sevron Brilliant Red B
0.54 %	Sevron Brilliant Red 3B
10.0 %	Sodium sulfate, anhydrous
2.5 %	Du Pont Retarder LAN

Jockey Red (2)

1.8 %	Sevron Orange G
0.8 %	Sevron Brilliant Red B
0.05 %	Du Pont Fuchsine Conc
10.0 %	sodium sulfate, anhydrous
2.5 %	Du Pont Retarder LAN

Cherry Red

2.5 %	Sevron Brilliant Red 4G
0.1 %	Sevron Blue B
2.0 %	Du Pont Retarder LAN

Maroon

2.0 %	Sevron Yellow L
2.5 %	Sevron Brilliant Red 4G
0.5 %	Du Pont Fuchsine Conc
0.3 %	Du Pont Brilliant Green Crystals

Medium Blue

1.8 %	Sevron Blue B
2.4 %	Sevron Blue 2G

Navy

0.4 %	Sevron Yellow R
1.9 %	Sevron Brilliant Red 4G
0.8 %	Du Pont Victoria Green Small Crystals

Turquoise

0.15 %	Sevron Blue 5G
0.05 %	Sevron Green B
10.0 %	sodium sulfate, anhydrous
4.0 %	Du Pont Retarder LAN

Kelly Green

3.0 %	Sevron Yellow L
0.5 %	Sevron Brilliant Red 4G
0.6 %	Du Pont Brilliant Green Crystals

Hunter Green

2.0 %	Sevron Yellow L
1.0 %	Sevron Brilliant Red 4G
0.6 %	Du Pont Brilliant Green Crystals

Gray

0.1 %	Sevron Orange L
0.04 %	Sevron Red L
0.6 %	Sevron Blue 2G
10.0 %	sodium sulfate, anhydrous
4.0 %	Du Pont Retarder LAN

Black (1)

1.0 %	Sevron Yellow R
1.7 %	Sevron Orange L
0.34 %	Du Pont Fuchsine Conc
0.8 %	Du Pont Victoria Green Small Crystals

Black (2)

0.42 %	Sevron Yellow R
1.1 %	Sevron Orange L
1.8 %	Sevron Brilliant Red 4G
0.62 %	Du Pont Victoria Green Small Crystals

APPENDIX B

Typical shade formulations for union-dyeing and cross-dyeing 55:45 blends of Orlon Type 42 acrylic fiber and wool

(Figures denote percentages on total fiber weight)

METHOD A

Orange

1.6 %	Du Pont Retarder LAN
0.6 %	Sevron Orange L
0.4 %	Sevron Brilliant Red 4G
0.1 %	Sevron Blue 2G
1.0 %	Capracyl Orange R
0.05 %	Du Pont Milling Red SWG Conc 125%

Tan

2.0 %	Du Pont Retarder LAN
0.19 %	Sevron Orange L
0.015%	Sevron Red L
0.20 %	Sevron Blue 2G
0.15 %	Capracyl Dark Brown B
0.05 %	Capracyl Yellow NW
0.014%	Capracyl Orange R

Medium Brown

1.6 %	Du Pont Retarder LAN
0.28 %	Sevron Orange L
0.10 %	Sevron Red L
0.60 %	Sevron Blue 2G
0.50 %	Capracyl Dark Brown B
0.03 %	Capracyl Yellow 3RD

Light Gray

1.6 %	Du Pont Retarder LAN
0.072%	Sevron Orange L
0.031%	Sevron Red L
0.42 %	Sevron Blue 2G
0.19 %	Capracyl Gray GN
0.016%	Capracyl Orange R
0.01 %	Capracyl Red B

Dark Gray

1.0 %	Du Pont Retarder LAN
0.25 %	Sevron Orange L
0.14 %	Sevron Red L
0.75 %	Sevron Blue 2G
0.26 %	Sevron Blue 5G
1.2 %	Capracyl Gray GN
0.12 %	Capracyl Orange R
0.02 %	Capracyl Red B
0.025%	Du Pont Anthraquinone Green GNN

Orlon-Pink/Wool-Gray

2.0 %	Du Pont Retarder LAN
0.3 %	Sevron Brilliant Red 4G
0.06 %	Sevron Blue B
0.25 %	Capracyl Gray GN

Orlon-Blue/Wool-Red

1.5 %	Du Pont Retarder LAN
1.0 %	Sevron Blue 2G
0.5 %	Capracyl Red BB

METHOD B

Dark Brown

0.64 %	Pontachrome Brown PGN
0.24 %	Pontachrome Brown HN Conc
1.1 %	Sevron Orange L
0.44 %	Sevron Brilliant Red 4G
0.3 %	Sevron Green B
0.8 %	Sevron Blue 2G
0.2 %	Sevron Blue 5G

Navy

0.75 %	Pontachrome Blue Black ZF Conc
0.15 %	Pontachrome Blue ECR
0.2 %	Sevron Yellow R
0.95 %	Sevron Brilliant Red 4G
0.4 %	Du Pont Victoria Green Small Crystals

Wool-Red/Orlon-Gray

1.0 %	Du Pont Milling Red SWB Conc 125%
0.12 %	Sevron Orange L
0.04 %	Sevron Red L
1.0 %	Sevron Blue 2G
1.0 %	Du Pont Retarder LAN

Wool-Gray/Orlon-Red

1.0 %	Pontachrome Fast Gray L
2.0 %	Sevron Brilliant Red 4G

Wool-Brown/Orlon-Red

0.25 %	Pontachrome Brown HN Conc
0.75 %	Pontachrome Brown PGN
1.0 %	Sevron Red L
0.5 %	Sevron Orange L

Wool-Navy/Orlon-Red

1.0 %	Pontachrome Blue Black RM Conc
1.0 %	Sevron Brilliant Red 4G
2.0 %	Du Pont Retarder LAN

Wool-Black/Orlon-Gray

3.0 %	Pontachrome Blue Black RM Conc
0.09 %	Sevron Orange L
0.036%	Sevron Red L
0.6 %	Sevron Blue 2G
2.0 %	Du Pont Retarder LAN

APPENDIX C

Typical shade formulations for union-dyeing and cross-dyeing 50:50 blend of Orlon Type 42 acrylic fiber and rayon

(Figures denote percentages on total fiber weight)

Light Blue

0.11 %	Celanthrene Violet CB
0.24 %	Celanthrene Brilliant Blue FFS Conc 200%
0.12 %	Poutamine Fast Blue BLL
0.018%	Pontamine Fast Violet 4BL

Black

1.16 %	Sevron Yellow R
1.42 %	Sevron Brilliant Red 4G
0.56 %	Du Pont Victoria Green Small Crystals
0.07 %	Du Pont Brilliant Green Crystals
2.49 %	Pontamine Fast Black PGR Conc 150%

Orlon-Blue/Rayon-Gold

2.0 %	Sevron Blue 2G
0.31 %	Pontamine Fast Yellow RL
0.025%	Pontamine Fast Red 3BL
0.010%	Pontamine Fast Blue 6GL

Orlon-Red/Rayon-Green

1.5 %	Sevron Brilliant Red 4G
0.25 %	Sevron Yellow R
0.125%	Sevron Blue B
1.5 %	Pontamine Fast Green GL

Orlon-Yellow/Rayon-Blue

0.5 %	Sevron Yellow L
1.4 %	Pontamine Fast Blue CPL

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CONVENTION NOTES

AT a recent meeting of the 1957 AATCC National Convention Committee, Chairman Ernest R Kaswell made a firm announcement of the complement of his committee to assist him in the forthcoming convention to be held November 14-16, 1957, at the Hotel Statler, Boston, Mass. All committee chairmen reported excellent prospects for a most successful convention.

The full committee is as follows:

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* * *

Tanatex Corp, Kearny, N J, a previously named exhibitor at the Boston Convention, has announced that it will show samples of fabrics dyed with Tanatex Carriers. The exhibit will attempt to demonstrate the high quality of dyeing achieved using Tanatex Carriers, plus the economy effected through their use.

AATCC Calendar

COUNCIL
Nov 14 (Lowell Technological Institute, Lowell, Mass); Jan 24 (New York, NY); May 23 (Philadelphia, Pa); Sept 19, 1958 (Piedmont area)

NATIONAL CONVENTIONS
Nov 14-16, 1957 (Hotel Statler, Boston); Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY)

DELAWARE VALLEY SECTION
Sept 13 (Joint meeting with New York Section at Hotel Hildebrecht, Trenton, NJ); Nov 1 (Kugler's Restaurant, Philadelphia, Pa); Dec 6 (Kugler's Restaurant, Philadelphia, Pa)

MID-WEST SECTION
October 26 (Bismarck Hotel, Chicago, Ill)

NEW YORK SECTION
Sept 13 (Joint meeting with Delaware Valley Section at Hotel Hildebrecht, Trenton, NJ); Dec 6, Feb 7 (New York, NY); April 11 (New Jersey area)

NIAGARA FRONTIER SECTION
Sept 27 (Buffalo); Oct 25 (Joint meeting with CATCC Ontario Section at St Catherines, Ont); Dec 6, Feb 21 (Buffalo); Apr 4 (Joint meeting)

NORTHERN NEW ENGLAND SECTION
Sept 13 (Outing—Wachusett Country Club, W Boylston, Mass); Dec 6 (Annual meeting, Hotel Continental, Cambridge, Mass)

PIEDMONT SECTION
Sept 27-28 (Annual Meeting—Hotel Barringer, Charlotte, NC)

RHODE ISLAND SECTION
Sept 27 (Ladies Night—Narragansett Hotel, Providence, RI); Oct 24 (Providence Engineering Society, Providence, RI); Dec 5 (Annual Meeting—Johnson's Hummocks Grill, Providence, RI)

SOUTH CENTRAL SECTION
Sept 20 (Hotel Patton, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Sept 13 (Harmony Club, Columbus, Ga); Dec 7 (Atlanta Biltmore Hotel, Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Sept 27 (Rapp's Restaurant, Shelton Conn); Nov 1 (Annual meeting, Hartford, Conn, area); Dec 13 (Rapp's Restaurant, Shelton, Conn)

ACTIVITIES OF THE LOCAL SECTIONS

Delaware Valley-New York

AN extensive discussion of AATCC Research will highlight a joint meeting of the Delaware Valley and New York Sections on September 13th at the Hotel Hildebrecht, Trenton, NJ.

Weldon G Helmus, Fair Lawn Finishing Co, AATCC vice president (Central Atlantic Region), will serve as chairman of the meeting, which will feature:

1) a welcome by a representative of Gov Robert B. Meyner of New Jersey;

2) short talks by the AATCC president (George O Linberg), executive secretary (George P Paine), and chairmen of the Executive Committee on Research (Charles W Dorn), summarizing development of the Association's research activities, the present research situation at Lowell headquarters, and relationships between the executive secretary's office and the Association's Research Committees;

3) Reports by Joseph E Norton, chairman, AATCC Committee on Colorfastness to Light; and Frank J Rizzo, chairman, AATCC Committee on Weathering of Textiles.

In addition to the above, the following will be seated at the head table: Charles A Sylvester, chairman, AATCC Technical Committee on Research; Harold W Stiegler, AATCC director of research; Richard R Frey, AATCC assistant secretary; Donald W Robinson, chairman, Delaware Valley Section; Donald E Marnon, chairman, New York Section; William H Leyking, chairman, Niagara Frontier Section; Edward A Chevrette, chairman, Hudson-Mohawk Section; Clarence A Seibert, technical program chairman, Delaware Valley Section; Matthew J Babey, technical program chairman, New York Section; and other officers of the Delaware Valley and New York Sections.

FUTURE PAPERS

"Dyeing Blends of Dacron Polyester Fiber and Cotton"—J J Iannarone, Jr, P L Speakman, O S Larson, R C Hurst, and E H Hinton, E I du Pont de Nemours & Co, Inc

"Cleaning Synthetic Fur Pile Fabrics"—Dorothy S Lyle, National Institute of Drycleaning

"Lighting Factors to be Considered in Textile Color Matching"—Warren B Reese, Macbeth Daylighting Corp

"Cross Index. III. New *Colour Index* Names and Numbers to Old Names and Numbers"

NOTICE TO AUTHORS OF PAPERS

MANUSCRIPTS for the *Proceedings* and for other publications of the American Association of Textile Chemists and Colorists shall conform to the requirements and standards given in this *Notice*. Before publication, manuscripts for the *Proceedings* shall be approved by the Editor, not only for editorial correctness according to the standards of this *Notice*, but also for content of technical matter. In his work, the Editor may enlist the aid of anonymous reviewers who are selected for expert knowledge in particular fields.

It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

AATCC strives to maintain a high scientific and professional standard for papers. Authors must make every effort to avoid the use of trade names, commercial products or process names wherever such use may be construed as advertising. Wherever possible, scientific nomenclature must be employed. It is recognized that in some instances trade names are necessary to avoid lengthy description. Certain trade names have been so widely used as to become generic and these normally are permissible. Further, some technical papers may involve the presentation of a new product or process wherein trade name reference is obligatory.

Giving due consideration to such valid exceptions, it is incumbent upon the author to maintain the proper scientific attitude, avoiding any expressions or devices aimed at promoting a particular product or process.

Questionable papers are to be referred to the chairman of the Publications Committee, who will submit them to an editorial board which would be appointed as needed. The Board would report to the Publications Committee, which would have the final voice in accepting or rejecting a paper.

MANUSCRIPTS — Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5x11-inch white paper. In addition to the *original*, at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" or "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see sixth paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragraph by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

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The spelling and rules of punctuation followed in manuscripts shall be those found in the "Merriam-Webster New International Dictionary"; abbreviations and chemical formulas shall conform to *Chemical Abstracts*.

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CHARACTERIZATION OF CELLULOSE DERIVATIVES BY MEANS OF THE X-RAY DIFFRACTOMETER*

LEON SEGAL and C M CONRAD
Southern Regional Research Laboratory[1]
New Orleans, La

In the considerable application of x-ray diffraction techniques to the study of the structure of cellulose fibers and of crystalline celiulose between 1913 and 1940, only conventional photographic methods for detecting and recording the intensity of radiation diffracted by the sample were available. The development of the x-ray diffractometer in 1945 incorporated electronic circuitry and high-efficiency Geiger counters into an x-ray diffraction instrument capable of directly measuring diffracted beam intensities and diffraction angles. The new instrument has freed the researcher from photographic darkrooms with their inconvenient related equipment, rigid standardization of photographic processing and nonlinear response. The instrument has been applied to a wide range of tasks with the result that data which were laborious to obtain before can be quickly and easily obtained.

In studies on the improvement of the properties of cotton fiber, the x-ray diffractometer has been used both qualitatively and quantitatively in evaluating the effects on the fine structure of the fiber of various chemical and mechanical treatments. Information and examples are presented to illustrate the application of the diffractometer to such operations as measurement of crystallite orientation, qualitative detection of the transformation of cellulose from one crystal type to another, measurement of the extent of crystal transformation or chemical cellulose complexes and determination of changes in degree of crystallinity of the cellulose in the fiber.

INTRODUCTION

THE earliest application of x-rays to the study and characterization of cellulose fibers apparently began in 1913 in Japan when Nishikawa and Ono (*28,29*) confirmed the presence of crystalline material in cellulose fibers by means of x-ray diffraction experiments. The presence of submicroscopic crystalline particles in cellulose fibers had been postulated much earlier by Nageli (*26*) in 1858 when he advanced his micelle theory of the structure of such fibers. In the period 1916-1938 x-ray diffraction was extensively employed by many workers for establishing the structure of cellulose fibers. During the early part of this period, up to about 1926, cellulose from various sources was examined and many studies were made whereby the physical and chemical behavior of cellulose fibers were correlated with their crystalline x-ray patterns (*13,14,15,30,31*). From 1926 to around 1930 x-ray data from cellulose fibers were interpreted in light of new advances which had been made concerning the configuration of glucose and the size and shape of atoms and molecules. It was during this period that Sponsler and Dore (*40,41*) and Meyer and Mark (*24,25*) developed what is the present-day concept of the structure of crystalline cellulose.

Studies of crystallite orientation within the fiber and its relationship to physical properties were made between 1933 and 1940 by Sisson and others (*3,10,38,39*). In the past two decades activity in the application of x-ray diffraction to cellulose was devoted principally to studies of the effect of various chemical processes on cellulose fibers.

In all of these important contributions as well as in many others the x-ray beams diffracted by the cellulose samples were intercepted and recorded on either photographic plates or films. Structure studies required that camera dimensions be known and that accurate measurements of the location of the various arcs and spots originating from the sample be made on the photographic negative. Crystallinity and crystallite orientation measurements required that measurements be made of the degree of blackening of the photographic emulsion as this is related to the intensity of the radiation diffracted by the sample and received by the emulsion. Not only is all of this a time-consuming technique, but exact control and rigid standardization of all phases of the photographic process are necessary. In addition, a photographic darkroom and related equipment are required.

THE X-RAY DIFFRACTOMETER

Elimination of the drawbacks of photographic recording in x-ray diffraction studies became possible with the development of the x-ray diffractometer by Friedman (7) in 1945. This instrument. which has been defined as "a parafocussing x-ray diffraction apparatus characterized by the use of a local intensity-measuring receiver for directly measuring the intensity diffracted at any particular angle 2-theta", incorporates electronic circuitry and a Geiger counter capable of detecting x-rays with high efficiency (*16*). A simple plan view of the diffractometer is shown in Figure 1. The modified Seeman-Bohlin parafocussing geometry as used in diffractometer design (*16*) intensifies the radiation received at the Geiger counter by causing the rays diffracted by the sample to converge to a very small area. In this scheme the flat specimen normally rotates on an axis which is coincident with the center of the calibrated arc carrying the receiver. Proper geometrical relationships are maintained by causing the specimen's rate of rotation to be half that of the scanning Geiger counter. X-ray beam intensity is converted into discrete pulses by the Geiger counter, while beam intensity is read from the insrument in any one of 3 ways: 1) from a mechanical register which counts the discrete pulses through a scaling circuit in a given time interval, 2) from a counting rate meter which indicates an averaged current flow dependent on the rate at which pulses are received, or 3) from a recording potentiometer which traces on a strip chart a curve of the averaged current flow. The last of the three gives better flexibility to the spectrometer as it automatically records the intensities received by a moving Geiger counter scanning through the radiation diffracted by a fixed or moving sample or the intensities received by a fixed counter receiving radiation diffracted by a rotating sample. In either case the movement of the chart is synchronized with the movement of the scanning counter or of the sample. It is this feature that permits angular positions to be read directly from the chart.

With the x-ray diffractometer finding many applications in technology, as for the identification of minerals and ores (*17,23*), quantitative analysis of crystalline organic and inorganic compounds (*2,18,42*), measurement of preferred orientation in metals (*6,32*), and estimation of the degree of crystallinity in polymers and elastomers (*1,19,20*), it is only natural that applications for the instrument would be found in the field of cellulose chemistry. At the Southern Regional Research Laboratory the diffractometer is used extensively to obtain qualitative and quantitative data on

*Presented before the Division of Cellulose Chemistry at the 130th meeting of the American Chemical Society, Atlantic City, NJ, Sept. 1956.
[1]One of the laboratories of the Southern Utilization Research and Development Div, Agricultural Research Service, U S Dept of Agriculture.

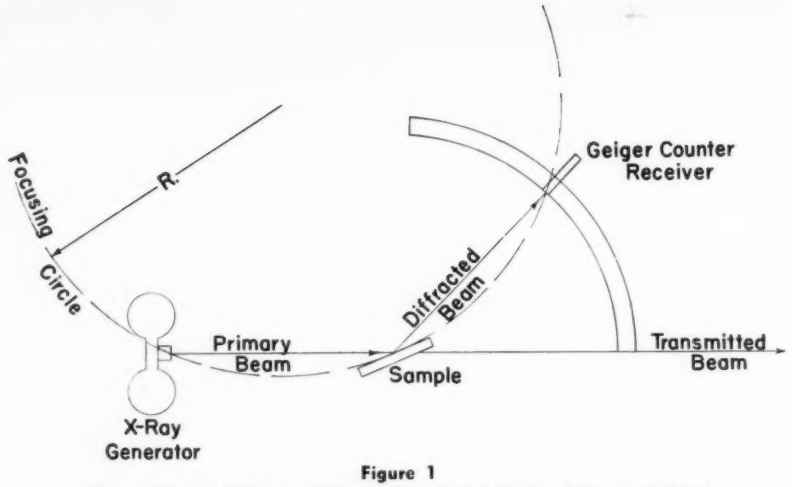

Figure 1
Plan view of diffractometer, with goniometer arc lying horizontal

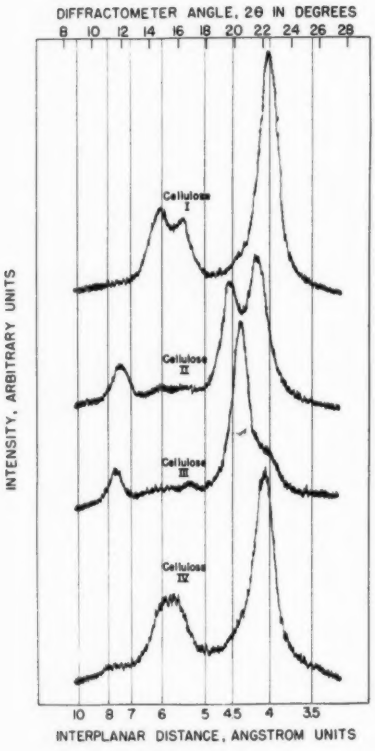
DIFFRACTOMETER ANGLE, 2θ IN DEGREES
8 10 12 14 16 18 20 22 24 26 28
Cellulose I
Cellulose II
Cellulose III
Cellulose IV
INTENSITY, ARBITRARY UNITS
10 8 7 6 5 4.5 4 3.5
INTERPLANAR DISTANCE, ANGSTROM UNITS

Figure 2
Radial tracings of celluloses I, II, III and IV

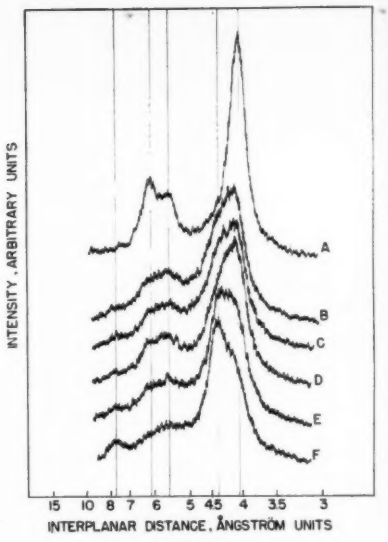

Figure 3
Radial tracings showing conversion of cotton cellulose I to cellulose III. Immersion time in anhydrous ethylamine: A—control; B—15 min; C—30 min; D—1 hour; E—2 hours; F—4 hours

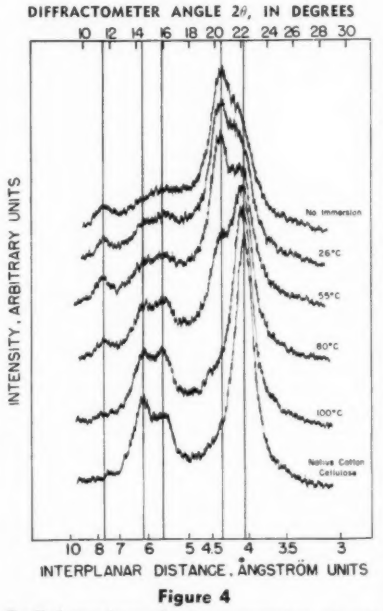

Figure 4
Radial tracings showing reversion of cotton cellulose III to cellulose I. Immersed in water at various temperatures

various cottons subjected to chemical and mechanical treatments. It has proven to be an invaluable tool in studies involving modification of the fine structure of cotton fiber.

APPLICATIONS TO STUDIES OF COTTON CELLULOSE

LATTICE SHIFTS——The ability of the diffractometer to clearly indicate shifts brought about in the cellulose crystal lattice is illustrated by figures taken from work done at the Southern Laboratory. The four polymorphic forms of cotton cellulose produce the diffractometer tracings of celluloses I, II, III and IV shown in Figure 2. In appearance these curves, as well as others to be shown, are identical with those obtained by scanning across photographic fiber patterns along the equator of the pattern with a recording densitometer. For obtaining these and other radial diffractometer tracings the dry fiber sample is first cut in a Wiley mill to pass a 20-mesh screen; a weighted quantity of the cut material is then pressed into a ½-inch disc under high pressure; and the resulting disc is placed in the instrument on a suitable flat specimen holder.

With the diffractometer one can readily follow lattice shifts as the crystal lattice is changed from one polymorphic form to another. The shift from cotton cellulose I to cotton cellulose III brought about by treatment with liquid ethylamine is shown in Figure 3, while the reverse shift brought about by treating cotton cellulose III with water at various temperatures is shown in Figure 4 (*37*).

IDENTIFICATION OF COMPLEXES——The curves in Figures 5 and 6 illustrate how the diffractometer facilitates the identification of cellulose complexes formed with various reagents. In Figure 5 are shown the curves of complexes of cotton cellulose with various diamines (*33*), while Figure 6 shows the effect of selected solvents on the cellulose-ethylenediamine complex (*22*). Since the chemist can have these data at his disposal in less than an hour, planning for further experimentation with such compounds can be accomplished without delay.

REDUCTION OF DEGREE OF CRYSTALLINITY——Since the coherent scattering of x-rays is a property of the crystalline portion of the cellulose, reduction of the amount of crystalline cellulose should reasonably be expected to affect the characteristic x-ray pattern. Such an effect

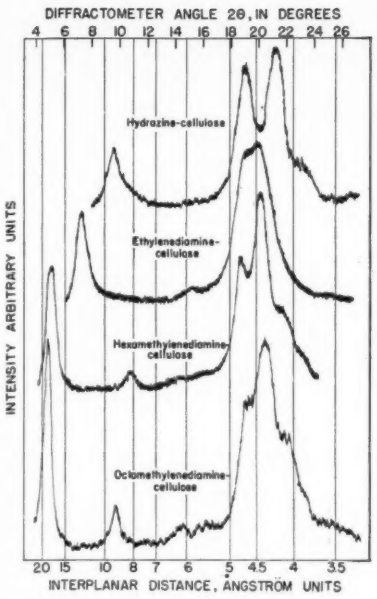
DIFFRACTOMETER ANGLE 2θ, IN DEGREES
4 6 8 10 12 14 16 18 20 22 24 26
Hydrazine-cellulose
Ethylenediamine-cellulose
Hexamethylenediamine-cellulose
Octomethylenediamine-cellulose
INTENSITY ARBITRARY UNITS
20 15 10 8 7 6 5 4.5 4 3.5
INTERPLANAR DISTANCE, ÅNGSTRÖM UNITS

Figure 5
Radial tracings of diamine-cellulose complexes prepared from cotton

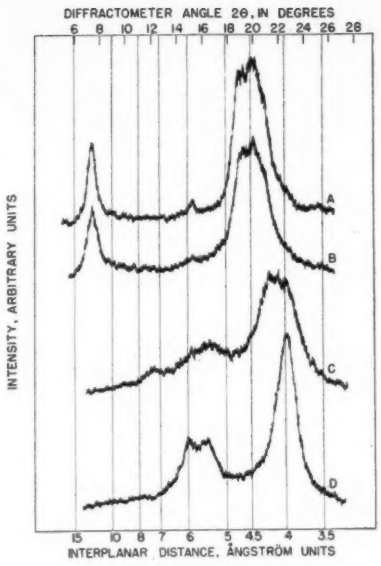
DIFFRACTOMETER ANGLE 2θ, IN DEGREES
6 8 10 12 14 16 18 20 22 24 26 28
A
B
C
D
INTENSITY, ARBITRARY UNITS
15 10 8 7 6 5 4.5 4 3.5
INTERPLANAR DISTANCE, ÅNGSTRÖM UNITS

Figure 6
Radial tracings showing effect of solvents on the ethylenediamine-cellulose complex: A—control; B—hexane; C—acetone; D—water

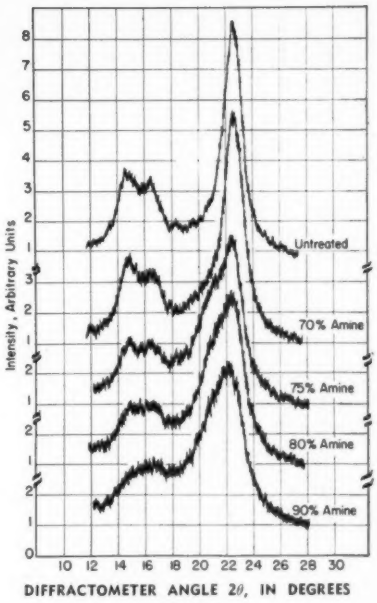

Figure 8
Radial tracings of cotton treated with concentrated solutions of ethylamine

has been reported by Hess (*8,9*) and by Hermans (*11,12*) using photographic recording. The curves of Figure 7 show how the diffractometer records the radiation diffracted by cotton decrystallized mechanically by being ground in a vibratory ball mill (*4*). As the chemical decrystallization of cotton does not destroy the fiber and is of greater practical interest, the progress and extent of decrystallization can be quickly and easily followed with the diffractometer. This is illustrated by the curves in Figure 8 showing the effect on crystalline cotton cellulose of concentrated solutions of ethylamine (*21*).

A variation in technique was used in obtaining the curves of Figure 9 showing the effect of anhydrous ethylamine on cotton celluloses I and II (*36*). This variation, which consists of holding fixed the specimen holder containing the disc of ground cotton fixed in a plane perpendicular to the primary beam while the Geiger counter scans the diffracted radiation, results in the tracings (called transmission tracings) being identical in appearance to densitometer curves taken across a Debye-Scherrer powder pattern of the ground celluloses. However, this technique is not frequently used because resolution of adjacent peaks usually is not too good and slight variations in thickness of the specimen disc can adversely affect the overall intensity of the pattern.

The diffractometer tracings are particularly useful for several reasons: 1) that marked decreases in the intensities of the crystalline interferences, which originate in the crystalline regions, are readily discernible if reductions in the degree of crystallinity have been brought about by decrystallizing reagents; and 2) this information can be obtained in a mere fraction of the time

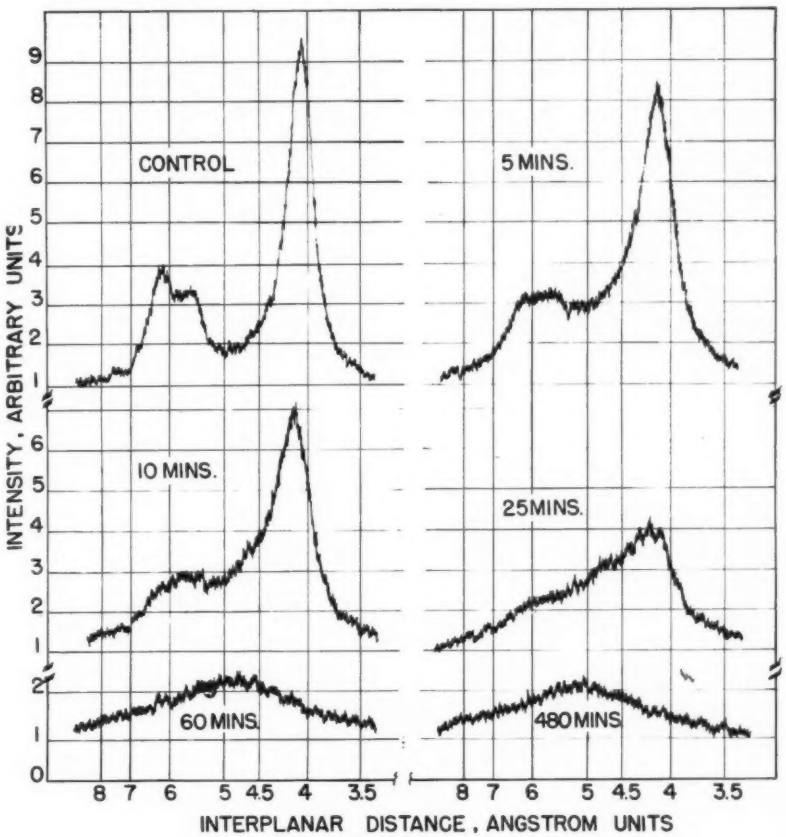

Figure 7
Radial tracings of cotton ground in a vibratory ball mill

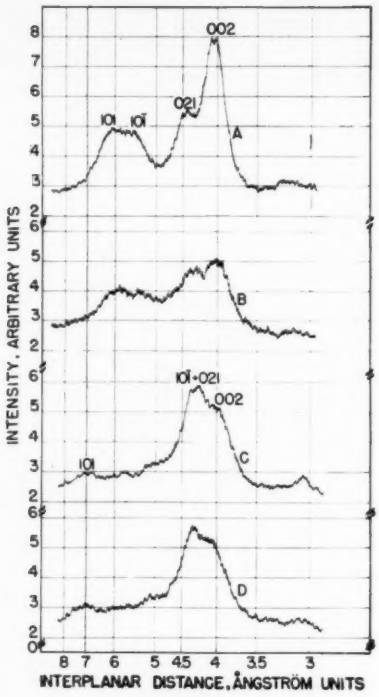

Figure 9

Radial tracings (transmission) showing the effect of anhydrous ethylamine on cotton celluloses I and II: A—untreated cotton cellulose I; B—after treatment; C—untreated cotton cellulose II; D—after treatment

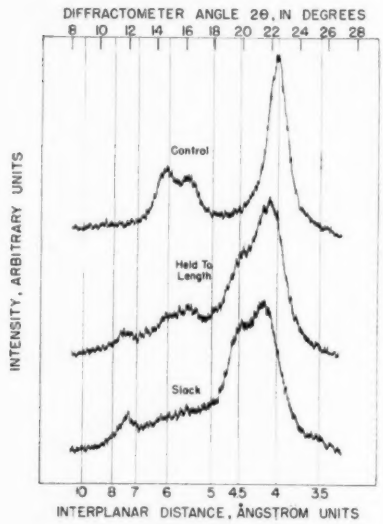

Figure 10

Radial tracings of yarns mercerized slack and mercerized under tension (held to constant length)

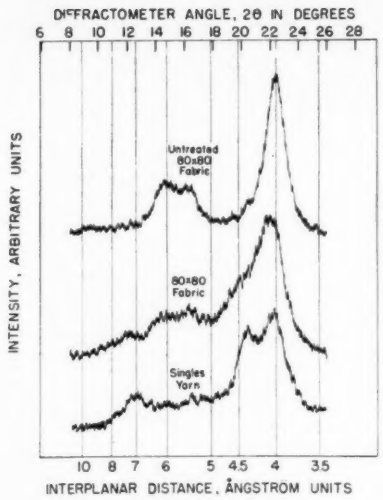

Figure 11

Radial tracings of yarn and fabric mercerized slack

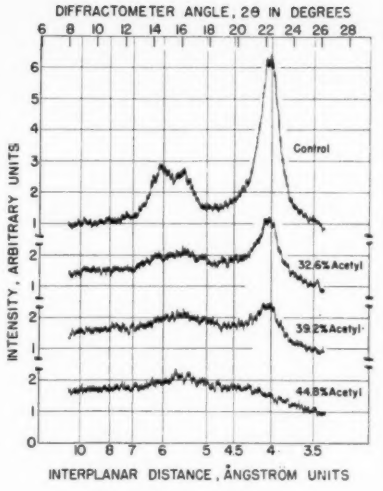

Figure 13

Radial tracings of highly acetylated cotton

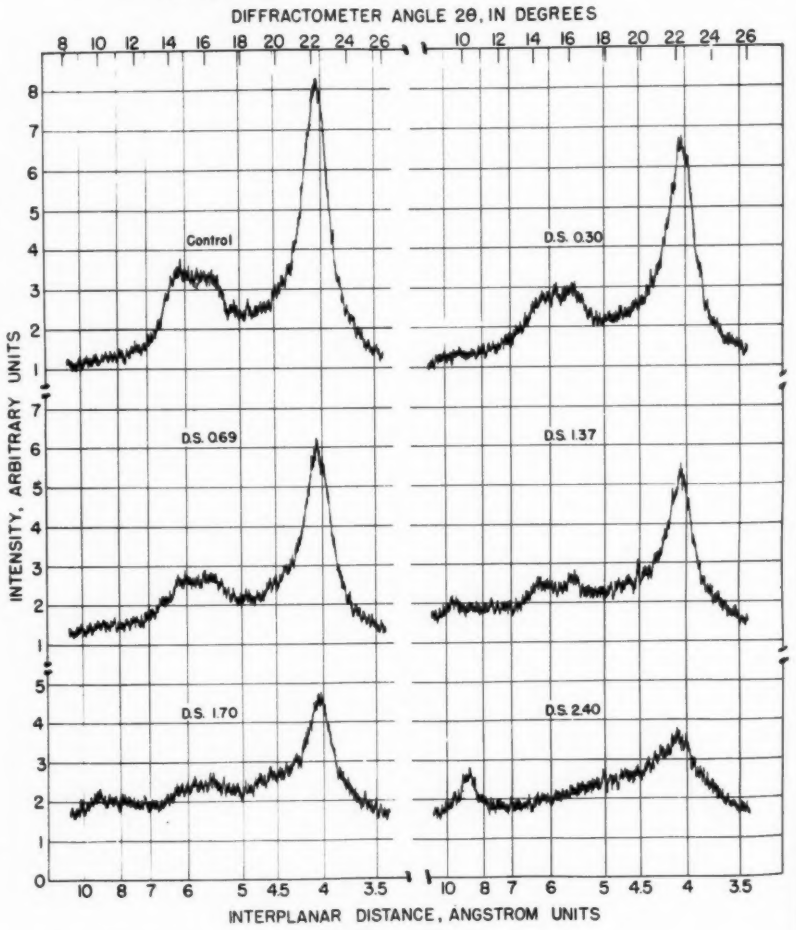

Figure 12

Radial tracings of cyanoethylated cottons of varying degrees of substitution

required to get crystallinity information by chemical or other physical means. The recorded data lends itself readily to quantitative measurements: methods of handling such measurements for obtaining estimates of the degree of crystallinity in cellulosic fibers are presently under study.

QUANTITATIVE ANALYSIS—— In a sample of cotton undergoing mercerization the transformation of cellulose I to cellulose II can be easily followed by means of the diffractometer. In fact, the advantages of the instrument are such as to strongly recommend it for process

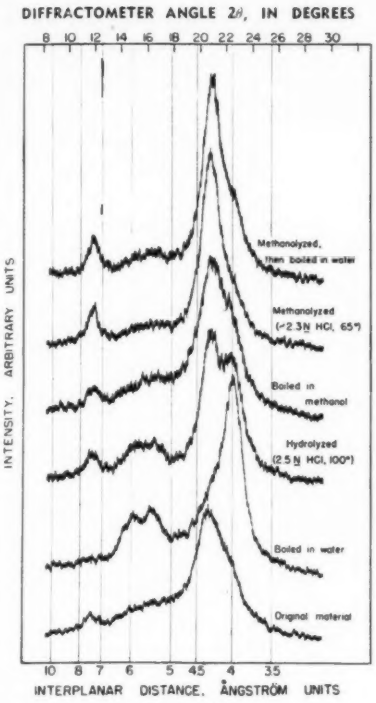
DIFFRACTOMETER ANGLE 2θ, IN DEGREES
8 10 12 14 16 18 20 22 24 26 28 30
INTENSITY, ARBITRARY UNITS
Methanolyzed, then boiled in water
Methanolyzed (~2.3N HCl, 65°)
Boiled in methanol
Hydrolyzed (2.5 N HCl, 100°)
Boiled in water
Original material
10 8 7 6 5 45 4 35
INTERPLANAR DISTANCE, ÅNGSTRÖM UNITS

Figure 14
Radial tracings made in solvolysis studies on cotton cellulose III

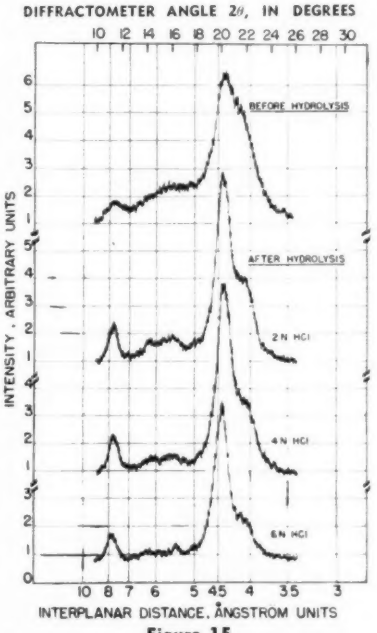
DIFFRACTOMETER ANGLE 2θ, IN DEGREES
10 12 14 16 18 20 22 24 26 28 30
INTENSITY, ARBITRARY UNITS
BEFORE HYDROLYSIS
AFTER HYDROLYSIS
2 N HCl
4 N HCl
6 N HCl
10 8 7 6 5 45 4 35 3
INTERPLANAR DISTANCE, ÅNGSTROM UNITS

Figure 15
Radial tracings made of hydrocelluloses of cotton cellulose III

control. Using x-rays provides a true index of mercerization since the positions and intensities of the interferences arise directly from the degree of change in the cellulose crystal lattice brought about by the chemical treatment. Anything that would interfere with or inhibit this change

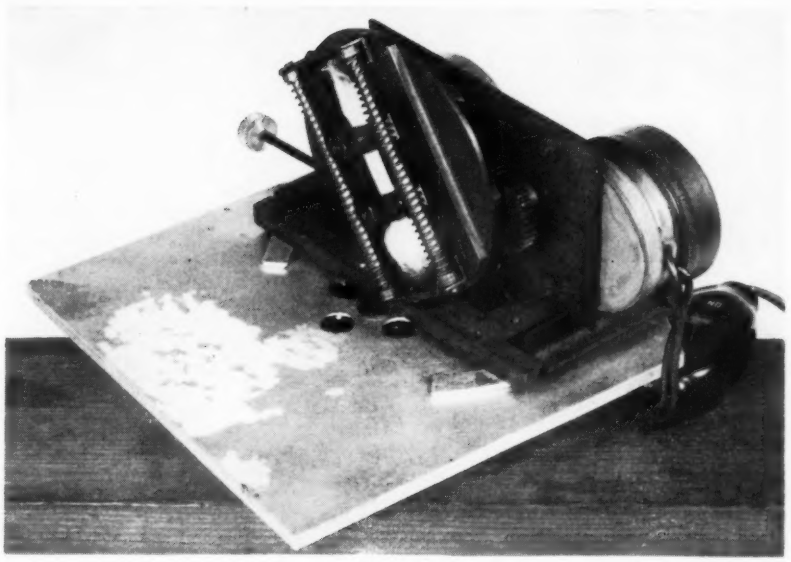

Figure 16
Rotating specimen mount used in measuring x-ray angle of cotton and other fibers

is reflected in the diffractometer tracings. The diffractometer tracings of mercerized yarns shown in Figure 10 illustrate how the tracing is affected by such factors (*43*). In this figure the yarns were under different tensions during mercerization, one was held to constant length while the other was mercerized slack. The tracing from the former shows partial conversion of the lattice while that of the latter shows complete conversion. Another illustration showing a similar effect is given by Figure 11 in which tracings from slack mercerized yarn and fabric are shown (*43*). In this case the diffractometer clearly shows the incomplete mercerization of the fabric arising from the restraining influence of the fabric structure itself on the mercerizing process.

The possibility of using the diffractometer in a similar manner for quantitatively following the course of substitution reactions is strongly suggested by the set of curves of Figure 12 taken from a batch of cyanoethylated cottons. In this set of curves the relationship between degree of substitution and height of the principal cellulose I interference was found to be highly linear when these values were plotted on rectangular coordinate paper (*43*).

Whereas the diffractometer tracings for highly substituted cyanoethylated cotton displayed new interferences, possibly arising from crystalline cyanoethyl cellulose, application of the instrument to another cellulose derivative, fibrous cotton cellulose triacetate, failed to bring out any characteristic crystalline interferences (Figure 13). As the few curves show, the apparently amorphous character of the material seems to increase with increasing acetyl content (*43*).

SOLVOLYTIC STUDIES——The x-ray diffractometer is an invaluable tool in solvolysis studies. Such data as that on cellulose III displayed in Figure 14 and 15 not only answer questions regarding solvent effects on cellulose fine structure but also seem to lead to new ones. For example, in Figure 14 the diffractometer shows that hydrolysis of cotton cellulose III with 2.5 N hydrochloric acid caused partial restoration or resolution of the cellulose I lattice, but that methanolysis (2.3 N methanolic hydrochloric acid) reduced or failed to develop that lattice (*27*). The tracings show that exposure of cotton cellulose III to boiling water caused complete lattice reversion, but that after exposure to aqueous hydrochloric acid the intensities of cellulose I present in the cotton decreased with increasing acid concentration (Figure 15) (*35*). These changes in cellulose fine structure are undetected and unknown in the course of normal solvolysis and kinetic studies, but with the aid of the x-ray diffractometer they can be easily revealed to lead to a fuller understanding of the processes under investigation.

ORIENTATION——A factor important in the structure and performance of textile fibers is that of crystallite orientation. With cotton fiber this parameter of a fiber's fine structure is usually measured more readily by means of x-ray diffraction in the manner developed by Sisson and Clark (*39*). The tedious photographic technique used in this method, though,

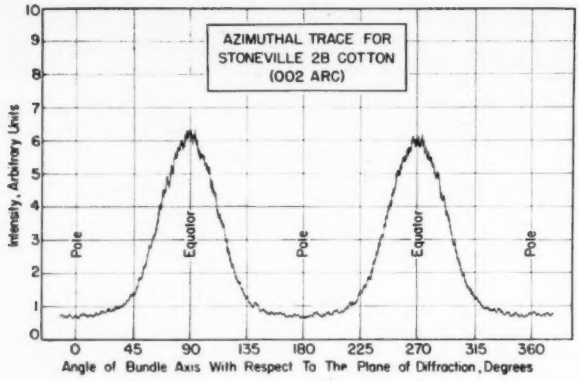

Figure 17
Azimuthal trace for Stoneville 2B cotton (002 arc)

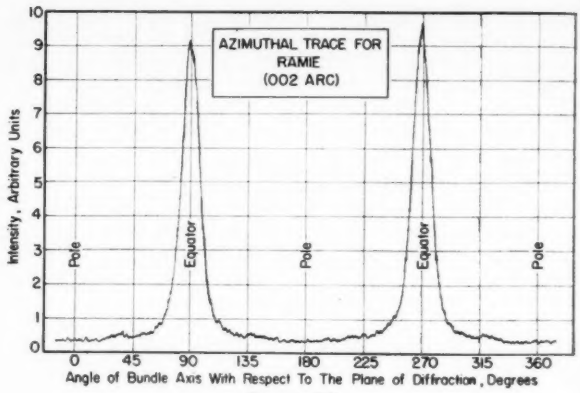

Figure 18
Azimuthal trace for ramie (002 arc)

involves making careful photometric measurements of the intensity around a characteristic arc, usually the 002 interference. From these measurements is obtained the so-called index of orientation, either the 40% or the half-maximum x-ray angles (*38*). This method of obtaining an index of crystallite orientation can be greatly facilitated from the standpoint of both time and effort by use of the x-ray diffractometer and a rotating specimen mount developed at the Southern Regional Research Laboratory (*34*).

This mount, seen in Figure 16, replaces the standard specimen mount used in the instrument. After insertion in the diffractometer, however, it is locked in place to prevent its supporting spindle from turning with movements of the scanning Geiger counter as does that of the standard mount. With the rotating platform carrying the sample bundle set perpendicularly to the primary x-ray beam, the diffractometer is operated by the transmission technique. A standard size bundle of parallelized fibers is held in combs under tension and the Geiger counter of the spectrometer is centered on the 002 interference. As the sample rotates in the x-ray beam, the radiation diffracted by the 002 planes of the sample sweeps across the window of the Geiger counter. The speed of rotation can be set to almost any reasonable value, being dependent principally on the speed of the drive motor and the ratio of the drive gears. The changing intensity of the diffracted beam, fluctuating as one would expect from examination of a photographic fiber pattern, is recorded on the strip chart as a series of symmetrical peaks and valleys similar in appearance to a densitometer record of photographically recorded intensities around the selected interference.

Such a tracing taken from a typical American cotton with a half-maximum angle of some 27° is shown in Figure 17 (*34*). The trace for highly oriented ramie, half-maximum angle of about 9°, is shown in Figure 18 (*34*).

In the figures just given, with the design of the present mount being as it is, the information required a total recording time of 30 minutes and appeared on a 15-inch length of chart ready for quick measurement and permanent filing. To make a strictly comparable measurement in the conventional photographic manner, an experienced operator would require 15 to 20 minutes just to photometer the photographic negative, while to this must be added the exposure time and the time required for processing the exposed film. Further studies at the Southern Regional Research Laboratory have indicated also that 30% improvement in precision can be realized using this improved technique (*5*).

SUMMARY

To sum up this presentation, then, it can be stated that the x-ray diffractometer has a definite place in the laboratory where cellulose and cellulose derivatives are being studied. The instrument makes available quickly and easily data which might not be available otherwise because of experimental difficulties of obtaining it by conventional methods. With the aid of this instrument effects of treatments can be readily followed, thereby permitting flexible planning of experiments. The speed and accuracy by which x-ray diffraction data are obtainable with the instrument suggests a possible utility as a process control instrument.

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News of the Trade

Air Reduction Starts Construction of Two New Chemical Plants

The Air Reduction Chemical Company division of Air Reduction Company, Inc, broke ground July 12th for two new chemical plants at Calvert City, Ky. One plant reportedly will have an annual production capacity of three million pounds of methyl butynol and methyl pentynol; the other plant will have an annual production capacity of two million pounds of vinyl stearate. These plants will be completed early in 1958 and will be the first in America to produce their respective products on a commercial basis, it is stated.

The Air Reduction Research Laboratories developed the processes which will be used in the plants. Methyl butynol, methyl pentynol and vinyl stearate are all based on acetylene. The company's National Carbide Company division operates at Calvert City what it believed to be the largest calcium carbide plant in the world for the generation of acetylene.

Scotchgard Promotion

An estimated 100 million persons will see and hear the story of Scotchgard brand stain-repeller by November 9th, according to its maker, Minnesota Mining and Manufacturing Co (3M), St Paul, Minn.

First nation-wide promotion of the new oil-repellent, fluoro-chemical finish was announced by the St Paul firm concurrent with the start of a major trade advertising campaign on July 30th.

The program is concentrating on applications of the stain-repeller to upholstery fabrics, men's worsted and worsted-synthetic apparel fabrics, and suede leather for men. Additional applications reportedly will be introduced in the near future.

Basic theme is the oil-repellency of the Scotchgard finish, which is claimed to be first in the history of the textile and suede leather industries to offer protection against not only water-borne stains, but oil-borne stains as well.

Another property of special interest to the upholstery industry is the stain-repeller's soil-resistance, which reportedly makes possible the brushing-off of any dry soil which may accumulate on a treated fabric.

Tennessee Corp's MR&D Dept Transferred

The Marketing Research and Development Department of the Tennessee Corp has been transferred to new, permanent quarters at 1330 West Peachtree-Suite 500, Atlanta 9, Ga. The new quarters contain about three times as much floor space as the prior site at 805 Peachtree Bldg, Atlanta.

Publication of *Chymia* to be Resumed

The publication of *Chymia*, an annual journal devoted to the history of chemistry, will be resumed in the spring of 1958.

The internationally-known publication will be co-sponsored by the Edgar Fahs Smith Collection, Univ of Pennsylvania, and the Division of History of Chemistry, American Chemical Society.

The editorial and governing body is composed of Henry M Leicester, College of physicians and surgeons, San Francisco; Dennis I Duveen, Duveen Historical Library; Sidney M Edelstein, Dexter Chemical Corp, and the following men from the University of Pennsylvania: Claude K Deischer, Murray G Murphy and Conway Zirkle.

The board has named Dr Leicester editor-in-chief and all communications regarding submission of manuscripts and editorial information should be forwarded to him.

The publisher will be the University of Pennsylvania Press, Thomas Yoseloff, director.

SCP Awards Contract for Charlotte Expansion

Standard Chemical Products, Inc has awarded a contract to the J A Jones Construction Co, Charlotte, N C, for the construction of additional laboratory facilities at Standard's Charlotte plant. Approximate cost will be $100,000.

NSP College Placement Conference

To further industry-college relations, National Starch Products Inc recently conducted a conference discussion and open house at its research laboratories at Plainfield, N J. The conference discussion included the subjects, "A Research Definition," "The 'Green Years' of the Technical Graduate," "Making a Chemical," and "Technical Selling." Conducting the various discussions were Donald Pascal, executive vice president: Robert Merritt, vice president of manufacturing; Carlyle G Caldwell, vice president of research; Vincent Upton, laboratory administrator, and Don Staunton, training director.

Among the placement directors participating were John W Andrews, Polytechnic Institute of Brooklyn: Walter R Campbell, St. John's University; David E Mader, Rutgers University (New Brunswick); Jack Obecny, Rutgers University (Newark); C K Wallace, Princeton University; and Marie P Wicker, North Carolina State College.

A highlight of the day was a tour of National's Research Laboratories where the placement directors witnessed new product demonstrations.

National Starch officials and college placement directors (l to r): David E. Mader, Jack Obecny, C K Wallace, C G Caldwell, Walter R Campbell, Don Staunton, Donald Pascal, John W Andrews, W V Upton, Marie P Wicker, R W Merritt

Onyx Names Burlington Astonized® Licensee

Onyx Oil & Chemical Co, Jersey City, NJ, has announced the appointment of Burlington Finishing Co as a licensee operating under the Aston license.

Burlington plans to feature Astonized men's suitings. An extensive promotion is planned to acquaint converters and garment workers with the important advantages symbolized by the Aston label on synthetic fabrics.

Under the terms of the license, Burlington will process synthetic fabrics of all types with Aston, and will make use of the "Astonized" trademark in the merchandising and labeling of such goods, and of garments made from such goods.

In its current promotional effort, highlighted by the theme "the most wanted finish since synthetics began," Onyx is stressing the concept of all-weather, all-humidity comfort for all synthetics—antilint, anticling properties in the winter; skin comfort through increased moisture absorption in the summer.

Onyx claims that the new Astonized fabrics repel lint and dust, prevent annoying static shocks, absorb moisture, never cling or ride up, yet retain every advantage of synthetics —wash and wear, shape retention, strength, and color—for the life of the garment.

The Aston durable antistatic finish is a polymeric electrolyte, which, although insoluble, is also hygroscopic. The cured compounds are nitrogenous anion exchange resins. The durability of the Aston finishes to washing and drycleaning is said to exceed by far that of any other known chemical finish for textiles. Further, the level of durability can be set as desired, depending on the fiber being treated and the end-use. Aston is applied with standard mill facilities by padding, frame drying, curing or heat-setting, and after washing and drying.

The ability of the hygroscopic resinous layer on the fabric, which is the Aston finish, to conduct electrical static charges is said to prevent these charges from building-up through the effects of friction. Since this layer is hygroscopic, the fabric also has the property of absorbancy.

It is stated that the Aston finish costs no more than any other basic functional finish while providing more fundamental advantages. In addition, Aston can be applied under practical plant conditions, with no special equipment, just as any resin finish is applied.

The following application characteristics of Aston are cited by Onyx:

1) Immediate solubility in water
2) Forms clear in-use baths
3) Moderate self-wetting properties
4) Good bath life
5) Low temperature range of liquor during application
6) No build-up on pad or quetsch rollers
7) Ease of bath dilution
8) Compatibility with a range of finishes
9) Application by conventional methods and equipment
10) Practical conditions for drying and curing
11) Suitability for subsequent mechanical finishing operations.

The finishing of textile material with Aston LT and Aston 108 involves the basic steps of applying the finish drying, curing, and after-washing. By this fundamental procedure and by controlling such variables as dry add-on, Aston-to-catalyst ratio, drying and curing conditions, it is said to be possible to attain a wide range of durability to washings and drycleanings.

The durability of the Astonized finish is said to be exceptional, regardless of whether detergent or soap is used. However, the finish cannot be subjected to chemical bleaches because it is stripped from the fabric by this method.

The following table shows machine wash durability of Aston finish on various synthetic blends using Aston LT or Aston 108. Washes are at 140°F, full cycle in a Westinghouse Laundromat, using Tide:

Fabric	*Durability by Number of Washes*	*Finish*
Orlon work clothes	140	Aston LT
Wool-Dacron-Orlon work clothes	75	Aston LT
Acrilan blanket	100	Aston 108
Nylon tricot	12 to 15	Aston LT
Dacron taffeta	40 to 50	Aston 108
Dacron sportswear	20 to 40	Aston 108 (½% dry solids)
Dacron-worsted suiting	50	Aston LT

The Astonized finish is said to be compatible with softeners and many other functional finishes so that polyfunctional finishes can be readily achieved.

Course in Fabric Use, Care and Renovation

The Evening School of the Philadelphia Textile Institute will present a new course for fabric manufacturers, converters, garment manufacturers, and retailers entitled "Fabrics: Their Use, Care, and Renovation," beginning Wednesday, September 25th, 1957 and continuing each week for fifteen weeks, 7:00 PM to 10:00 PM.

The course will cover proper care of textile garments and fabrics during use and wear, through the processes of renovation in commercial drycleaning and laundering.

There will be included the identification of fibers, fabrics, weaves, dyes and finishes; modern drycleaning techniques including appraisal of the limitations of water activity in the hydrocarbon drycleanng solvents; modern laundering processes; the identification of soils and stains and employment of the newest methods for their removal; restoration of textile garments and fabrics with the modern commercial refinishing processes.

The course will be conducted by William Mooney, fabric renovation consultant, and John Parsley, research fellow at the Institute.

"Fibers and Civilization" Film Planned

A new film, tentatively titled "Fibers and Civilization," is expected to be put into production late in September or October at the Old Slater Mill Museum, Pawtucket, RI.

It will be made available to school and other groups wanting visual education material on textile fibers. Chemstrand Corp, Decatur, Ala, is sponsoring the film, which will deal with the basic fibers (cotton, wool, flax and silk) and also include some material on synthetic fibers.

Costumed players may be called for in the script. If so, a cast made available through cooperation of Pawtucket Community Players for a film on American industrial beginnings which was filmed in part at the Museum earlier this Summer may be called on again.

CORRECTION

YOUR attention is called to a printing error on page 568 of the July 29, 1957 issue involving the patent abstract entitled, "Shrink-resistant Wool—Polymers of Chlorosubstituted Acrylic Esters Applied," U S Pat 2,780,608.

The formula comprising the 11th line of the abstract is in error. It should correctly be as follows:

$CH_2=CRCOOCH_2CH(OH)CH_2Cl$

Westvaco Expands Lawrence Sodium Phosphate Lines

Westvaco Mineral Products Division of FMC has added production of monosodium phosphate and trisodium phosphate anhydrous at its Lawrence, Kansas plant to its previous output of sodium tripolyphosphate, tetrasodium pyrophosphate, disodium phosphate and phosphoric acid at this location. Warehouse stocks of glassy phosphates and potassium phosphates are also now being maintained at Lawrence. These additions to the products available from Lawrence now makes a full line of Westvaco phosphates available from three strategic locations across the country. . . . Lawrence: Carteret, N J; and Newark, Calif.

Synthetic Fiber Clip-out Catalogue

Drawing on the research data of synthetic fiber manufacturers in the country, *Bride and Home* magazine's Fall issue gives a complete rundown on the correct usage of synthetics to do the job they're best suited for.

The fibers covered in this report are Celaperm, Arnel, Acrilan, Chromspun, Coloray, Dacron, Dynel, Fiberglas, Fortisan, nylon, Orlon, and Super L.

Included in the article is a special cut-out catalogue of these twelve widely used synthetic fibers, stressing their virtues and drawbacks. It can be clipped and filed for future reference.

An explanation of the "blends" and "combinations" found in everything from clothing to carpeting is designed to serve as a guide to the future purchasing of the best quality in fibers.

The editors of *Bride and Home* prepared the report after working with the research staffs of American Viscose Corp; Allied Chemical & Dye Corp; American Enka Corp; Chemstrand Corp; E I du Pont de Nemours & Co, Inc; Owens-Corning Fiberglas Corp; Union Carbide Corp; Courtaulds (Alabama), Inc; Tennessee Eastman Co; and Celanese Corp of America.

Boulton

Joint Meeting—Fiber Society and Textile Institute

John Boulton, director of Courtaulds Ltd, president-elect of the Society of Dyers and Colourists, and honorary secretary of The Textile Institute will be guest speaker at the Thursday evening banquet of the Joint Meeting of The Fiber Society, Inc, and the Textile Institute. The meeting will be held September 4-6 at the Hotel Statler, Boston, Mass.

In addition to Mr Boulton, distinguished guests from Great Britain and Holland participating in the six morning and afternoon sessions include: Geoffrey Loasby, chairman of the Council of The Textile Institute; H L Roeder, N V Onderzoekingsinstituut Research; A R Urquhart, assistant director, Shirley Institute; T Vickerstaff, Imperial Chemical Industries, Ltd; Allan Draper, vice president, The Textile Institute; D C Hookway, Research Dept, British Nylon Spinners Ltd; J Wilson, director, British Rayon Research Institute; C H Crabtree, member of Council, The Textile Institute; and Prof J B Speakman, Leeds Univ.

Session chairmen from the United States include: Charles R Stock, American Cyanamid Co, chairman of the Program Committee of The Fiber Society; Howard J White, Jr, Textile Research Institute; and Joseph L Barach, Celanese Corp of America.

Burt Johnson, National Cotton Council, president of the Fiber Society, will preside over the joint meeting and will address the opening session.

Walter J Hamburger, Fabric Research Laboratories, Inc, is handling local arrangements for the meeting. Dr Hamburger is a past president of The Fiber Society.

The banquet, at which Dr Johnson will preside and Mr Boulton will speak, is scheduled for Thursday evening, September 5. A business meeting will follow the afternoon technical session on September 4.

The following papers will be delivered:

"Mechanical Breakdown in Textile Fibers", B D Coleman, Mellon Institute.

"High Speed Testing of Fibers", J. W. Ballou, Textile Fibers Department, E I duPont de Nemours & Co, Inc.

"The Evaluation of the Spinning Properties of Man-Made Staple Fibers", H L Roeder.

"Relationship Between Air Permeability and Structure of Woven Fabrics", M M Platt, W G Klein, C A Lermond, and C C Chu, Fabric Research Laboratories, Inc. The paper will be presented by Dr Platt.

"The Reactivity of Cellulose", A R Urquhart.

"Fast Dyes on Cellulosic Fibers", T Vickerstaff.

"Factors Influencing the Crystal Structure of Cellulose Triacetate", B Sheldon Sprague, Celanese Corp of America.

"The Cold-Drawing of Nylon 66", D C Hookway.

"Textile Applications of Fluid Beds", J Wilson and F G Audas, British Rayon Research Assoc. The paper will be presented by Mr Wilson.

"Basic Actions as an Approach to Textile Fiber Processing", Edward R Schwarz, Massachusetts Institute of Technology.

"Reactivity of Keratin", J B Speakman.

"Microscopic Studies on the Structure and Composition of Animal Fibers", J Menkart and A B Coe, Textile Research Institute. The paper will be presented by Dr Menkart.

Attendance will be limited to members of The Fiber Society, Inc, and The Textile Institute and to those receiving special invitations.

General Calendar

AMERICAN OIL CHEMISTS SOCIETY
Sept 30-Oct 2, 1957 (Fall meeting, Cincinnati); Apr 21-23, 1958 (Memphis); Oct 20-22, 1958 (Chicago); Spring, 1959 (New Orleans); Fall, 1959 (Los Angeles)

AMERICAN SOCIETY FOR QUALITY CONTROL—TEXTILE DIVISION
8th Annual Conference—Jan 30-Feb 1, Clemson House, Clemson, SC

AMERICAN SOCIETY FOR TESTING MATERIALS (COMMITTEE D-13)
Oct 15-18 (Fall meeting, Sheraton McAlpin Hotel, New York, NY); Mar 18-21 (Spring Meeting, Sheraton Park Hotel, Washington, DC).

THE FIBER SOCIETY
Sept 4-6 (Joint meeting with the Textile Institute—Hotel Statler, Boston, Mass); April 30—May 1 (The Clemson House, Clemson, SC)

NATIONAL COTTON COUNCIL OF AMERICA
October 2-3 (Chemical Finishing Conference—Statler Hotel, Washington, DC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Sept 10, Oct 8, Nov 12 (Palm Terrace Suite, Hotel Roosevelt, New York, NY)

• NEW PRODUCTS AND DEVELOPMENTS •

Cibacron Dyes

With the introduction of a new range of the dyestuffs for celluloisc fibers—the Cibacron dyes—Ciba Co, Inc feels that a widely recognized need in the textile dyeing field has been filled. The new dyes are said to meet fully requirements for brilliance of shade and high degree of fastness on cotton, rayon, and silk.

The Cibacrons are said to react chemically with the cellulose molecule, providing a strong bond. When applied in padding, printing or dyeing, the Cibacrons are said to exhbit high all-round fastness, especially to light, drycleaning, washing and crocking, and retain their natural brilliance.

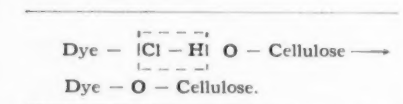
At this time the following Cibacron colors are available, and more will be added as the range is extended:

Cibacron Brilliant Yellow 3G
Cibacron Yellow R
Cibacron Brilliant Orange G
Cibacron Scarlet 2G
Cibacron Brilliant Red 3B
Cibacron Rubine R
Cibacron Blue 3G
Cibacron Turquoise Blue G.

The Cibacron dyes are applied in a short, simple dyeing cycle, which includes fixing with alkali and salt to effect a reaction between the dye and the fiber. Said to be especially suited to padding and printing procedures, the new dyes reportedly require only regular dyehouse equipment and such chemicals as common salt and soda ash. Short procedures at comparatively low temperatures are said to result in economical application and protection of fabric quality.

Dyeings produced with Cibacrons are exceptionally brilliant and offer the dyer the opportunity of producing bright shades never before attainable on cotton and viscose rayon textiles, it is claimed.

It is reported that each of the Cibacron dyes has a reactive chlorine atom which combines with the hydrogen atom of the hydroxyl groups of the cellulosic material to form a very stable compound:



The resultant compound is said to be very stable to washing.

Combining brilliance and fastness in colors for cellulose and silk, the Cibacron dyes reportedly yield clear prints with good contrasts, or level paddings and dyeings in attractive self shades. The eight initial colors are compatible with each other, it is stated, and they can be blended for a very interesting range of fashion shades. Prints produced with Cibacron dyes reportedly may be stored for any period—both before and after steaming—without adverse effect.

Ciba points out that the scope of the Cibacrons use in textile printing is very wide. The Company states that in direct printing, they can be applied to natural and regenerated cellulose fibers as self shades and also alongside many other classes of dyes, such as Ciba and Cibanone vat dyes, Cibantines, Cibaneutrenes, Coprantine direct dyes, Aniline Black, and Neosol Printing Black BD; on naphthol prepares, they can be printed alongside Ciba bases and salts; and in resist printing, they can be used for colored resists under pad dyeings produced with Aniline Black, naphthol blue, and Cibantine dyes. Pad dyeings produced with dischargeable Cibacron dyes may be discharged white or colored and also resisted to give good white or colored resists, it is claimed.

Additional advantages of the Cibacron dyes when used in printing are cited by Ciba Co, Inc as follows:

1) They present no difficulties in roller or screen printing.

2) They yield sharply defined outlines and well-penetrated level blotches.

3) Print pastes are smooth and exhibit good flow characteristics on both copper and chromium-plated rollers.

4) They are removed completely by the doctor blades and therefore not transferred to other rollers.

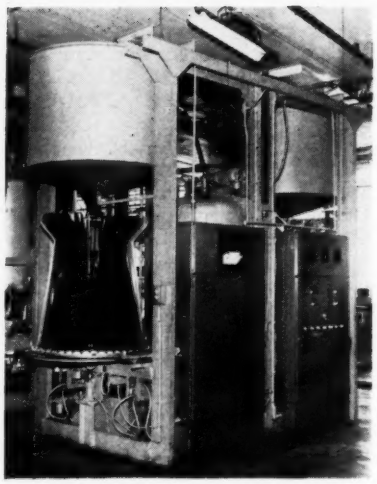
5) Crushing does not bring about any noticeable reduction in color intensity.

6) Since the color of the print pastes is visible during printing, the danger of faults occurring is minimized.

Brewin All-Purpose Hosiery Machine

Turbo Machine Co, Lansdale, Pa, has announced the signing of an agreement with E H Brewin and G H Brewin, covering the manufacture, sales and service of an "all-purpose" hosiery machine in which preboarding, scouring, dyeing, finishing, and final boarding are said to be accomplished simultaneously.

The machine, formerly built by Turbo for Dyotherm Corp, Clementon, N J, has been the subject of suits and counter-suits in recent months.



The Brewin All-Purpose Hosiery Machine

Turbo will call the machine the Brewin Machine after the inventors, Grant H Brewin and his father, E H Brewin. Grant H Brewin is joining the Turbo organization.

A number of the Brewin Machines are already installed and in operation. Turbo has taken over the servicing of these machines. Improvements in the process and future design changes in the Brewin Machine are also the responsibility of Turbo.

In the Brewin Machine, preboarding takes place during the dyeing cycle, followed by finish boarding. Production is estimated at over 100 dozen pairs of stockings per 8-hour shift.

There are two separate dye systems. By means of a selector switch, the machine will operate from either dye system. Positive controls for time, temperature, and dye measurement are claimed to assure identical results from lot to lot.

Hostapal HL

Farbwerke Hoechst AG of West Germany manufactures a product known as Hostapal HL which, as several manufacturers and users here and abroad reportedly have established, creates the most severe conditions in connection with stress cracking tests for polyethylene.

Hostapal HL is available through Carbic Color & Chemical Co, Inc, New York, NY, technical representatives and distributors for Farbwerke Hoechst AG in this country.

• NAMES IN THE NEWS •

Shelton

Harold G Shelton has been appointed director of marketing for the Dyestuff & Chemical Division of General Aniline & Film Corp. The appointment will become effective on September 1st.

Mr Shelton has been sales manager of Antara Chemicals since he first joined General Aniline in 1945. In his new position, Mr Shelton will take over responsibility for all marketing and sales activities of the Dyestuff & Chemical Division, including that of General Dyestuff Co, which is the sales division for dyestuffs and related products.

Williams Haynes, internationally-known historian in the field of industrial chemistry, has been selected to receive the Dexter Chemical Corp Award in the History of Chemistry for 1957.

The annual Award, administered by the American Chemical Society's division of History of Chemistry, will be presented to Mr Haynes, Sept 11, during the society's 132nd national meeting in New York. The Award, presented for the first time last year, was established by Dexter to recognize "noteworthy contributions to the advancement of the history of chemistry."

Mr Haynes, the former owner and publisher of well-known business and technical publications, has written the following books, among others: "Chemical Economics," "Men, Money and Molecules," "Cellulose, the Chemical that Grows," and "The Chemical Front."

Carbic Color & Chemical Co, Inc, technical representatives and distributors for Farbwerke Hoechst AG, has added to its sales staff David B Ekstrom, Jr and Richard M Locke.

Mr Ekstrom's last position was that of director of technical service and sales for Otto B May, Inc. He will headquarter at Greensboro, N C.

Mr Locke was recently sales manager for Pittsburgh Coke & Chem Co. He will serve from Spartanburg, SC.

Ward

Ciba Co, Inc has selected E Pierce Ward to serve as technical service manager for its Southern District Office in Charlotte, NC.

Mr Ward returned to Ciba in 1944, after short periods with the Company in New York and the Graniteville Co and three years teaching at Clemson College. He was in charge of the Research Section, supervised establishing standards and test methods for the new Toms River dye plant, and served as manager of the Company's Technical Service Dept.

Harm

Pickard

Goldberg

Onyx Oil & Chemical Co, Jersey City, NJ, has named Rodney H Harm and Clarence E Pickard sales representatives for its Textile Division. Louis S Goldberg has joined the Division's Customer Service Dept.

Mr Harm, formerly with Burlington Industries' Dublin Finishing Plant, will represent Onyx in the Piedmont region, with headquarters in Greensboro, NC.

Mr Pickard, associated for the past six years with Burlington Industries' Dyeing and Finishing Div, will cover South Carolina and southern North Carolina from Charlotte, NC.

Glass

Robert Glass has joined Stein, Hall & Co, Inc as a general sales representative at its New York Branch Office.

For the past twelve years Mr Glass has operated his own business and acted as an independent consultant in the adhesive and allied fields.

Roman W Kulow, formerly with the Heyden Newport Chemical Corp, has joined the Product Development Dept of Olin Matieson Chemical Corp's High Energy Fuels Organization with headquarters at Niagara Falls, NY.

New appointments in the Marketing Research and Development Department of the Tennessee Corp, Atlanta, Ga, have been announced as follows:

George A Howland, formerly director of market research for the Corporation's Research Laboratories, has been named manager of technical service in the MR&D Department.

Edwin B Davidge, Robert O Derrick, and Jack P Haunson have joined the Department as market development specialists. Mr Davidge was formerly with Sharples Div of Pennsylvania Salt Mfg Co, in a sales capacity; Mr Derrick, with Springs Cotton Mills as purchasing agent for chemicals; and Mr Hunson, with Tennessee Corp's Research Laboratories in a research chemical engineering capacity.

John H Talley has been named to head the New Memphis district sales office of International Salt Co. The new office serves a tri-state territory which was served formerly by the Company's New Orleans and Atlanta district offices. Located at 3355 Poplar Ave Bldg, the Memphis office is responsible for a territory covering Arkansas, approximately the northern half of Mississippi and the western half of Tennessee.

Mr Talley has served for the past three and one-half years as assistant district manager of International's Cincinnati office.

• PATENT DIGEST •

PAUL WENGRAF

HYDROPHOBING OF TEXTILES—Condensates of Zirconium Alcoholates and Fatty Acids Applied G,2,02

US Pat 2,774,689 (Farbwerke Hoechst—Orthner, Reuter—Dec 18, 1956)

Zirconium alcoholates or aluminum alcoholates reacted with higher carboxylic or sulfinic acids are used to render textile fibers water repellent. The preamble to this patent states that hydrophobing processes based on aqueous dispersions of zirconium compounds and paraffin are known. The current invention calls for the use of zirconium alcoholates with carboxylic or sulfinic acids in combination with other high-polymer compounds. As an option, aluminum alcoholates may be used to replace the zirconium alcoholates in part.

Zirconium alcoholates (esters) are derived from methanol, ethanol, octylalcohol, etc (eg, zirconium ethylate or isopropionate), optionally stabilized against moisture by the addition of substances that undergo desmotropic rearrangement, such as ketone oximes, acetonyl acetone, or the like. The alcoholates are condensed at a ratio of from 1:0.5 to 1:2 with one of the aforementioned acids, eg, oleic or stearic acid, or with sulfinic acids obtained by sulfochlorination of Diesel oil and the like. High-molecular compounds to be added are, preferably, paraffin, natural or synthetic waxes, and/or polychlorinated hydrocarbons. In the latter event, an additional flame-resistant effect may be obtained. Preparation of these condensates reportedly is described in a copending application of Oct 6, 1956.

The present patent refers principally to the treatment of textile fibers with organic solutions of the condensates or mixtures of the components. In the latter event, the reaction is started in the cold and is completed during the heat treatment of the goods.

Example: A solution of zirconium ethylate, condensed with stearic acid plus paraffin and dissolved in carbon tetrachloride, was used to impregnate air-dried poplin garments for 15-20 min at 60°C. Acetonyl acetone was added as a stabilizer. After the excess solvent was removed, the fabrics were dried in air of 30% moisture content and ironed.

The process is said to be especially suitable for hydrophobing immediately after a drycleaning operation. No durability of the effect is claimed.

References cited by the Patent Office:

USPat 2,398,272 (Monsanto Chem Co/1946): rendering textiles hydropholic by applying solutions of alkylcarbamyl- or alkylsulfamyl-substituted benzoic acids and after-treating with heavy metal salts, among them zirconium salts [cf *Am Dyestuff Reptr 35*, 504 (1946)]

USPat 2,670,303 (Johnson & Son/1954): rendering textiles water repellent by impregnating with solvent solutions of mixtures of waxes, polymerized high-alkyl-vinyl ether and the like plus aluminum or zirconium alkoxides, eg, aluminum isopropoxide.

WATER-REPELLENT COMPOSITION ——— Organosilicones plus Titanium Compounds G,2,02

USPat 2,774,690 (Bradford Dyers' Assoc—Cockett et al—Dec 18, 1956)

Hydrophobing effects produced with organosilicones are substantially improved by combining the organosilicones with titanium compounds, such as titanic acid esters (ethyl titanate, butyl titanate), fatty acid salts of titanium (titanium acetate, laurate or stearate), or hydrolyzable inorganic titanium salts (halides or sulfates).

The organosilicon compounds are, for instance, mixtures of methylpolysiloxanes (20-70%) with methyl hydrogen polysiloxanes (80-30%) as specifically described in USPat 2,588,-365 (Dow Corning—Dennett—1952). Proportions of Ti compounds to organosilicones may vary over a wide range. A certain improvement has been made when 1-150% (preferably 5-125%) of the titanium compound calculated from the silicon compound's weight is applied. The optimum ratio will depend on the particular compounds and the materials to be treated.

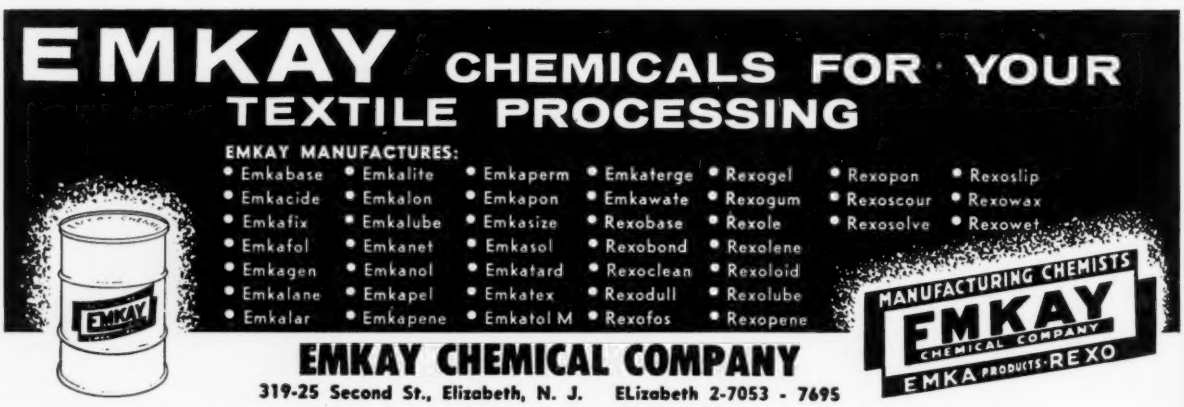
Example: A plain weave nylon fabric was impregnated with a solution of 1.875 p of an organosilicone and 0.125 p butyl titanate in 98 p petroleum spirit and air dried at 20° C. This specimen was tested for water repellency according to the "Bundesmann" test in which absorption and penetration are determined. In both respects the results were found to be by far superior to the effects obtained when 2% of either component alone was applied.

Among the references cited by the Patent Office:

USPat 2,732,320 (Guillissen/1956) describes coatings with organopolysiloxanes applied at temperatures below 150°C upon the addition of an alkyl-o-titanate.

USPat 2,512,058 (Du Pont/1950): organosilanols or hydrolyzates from organo chlorosilanes are mixed with ethyl-o-titanate or similar esters of titanic acid and refluxed to produce hard silicone resins.

USPat 2,588,365 (Dow Corning Corp/1952): see above.


EMKAY CHEMICALS FOR YOUR TEXTILE PROCESSING
EMKAY MANUFACTURES:
• Emkabase • Emkalite • Emkaperm • Emkaterge • Rexogel • Rexopon • Rexoslip
• Emkacide • Emkalon • Emkapon • Emkawate • Rexogum • Rexoscour • Rexowax
• Emkafix • Emkalube • Emkasize • Rexobase • Rexole • Rexosolve • Rexowet
• Emkafol • Emkanet • Emkasol • Rexobond • Rexolene
• Emkagen • Emkanol • Emkatard • Rexoclean • Rexoloid
• Emkalane • Emkapel • Emkatex • Rexodull • Rexolube
• Emkalar • Emkapene • Emkatol M • Rexofos • Rexopene
EMKAY
MANUFACTURING CHEMISTS
EMKAY
CHEMICAL COMPANY
EMKA PRODUCTS-REXO
EMKAY CHEMICAL COMPANY
319-25 Second St., Elizabeth, N. J. ELizabeth 2-7053 - 7695

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